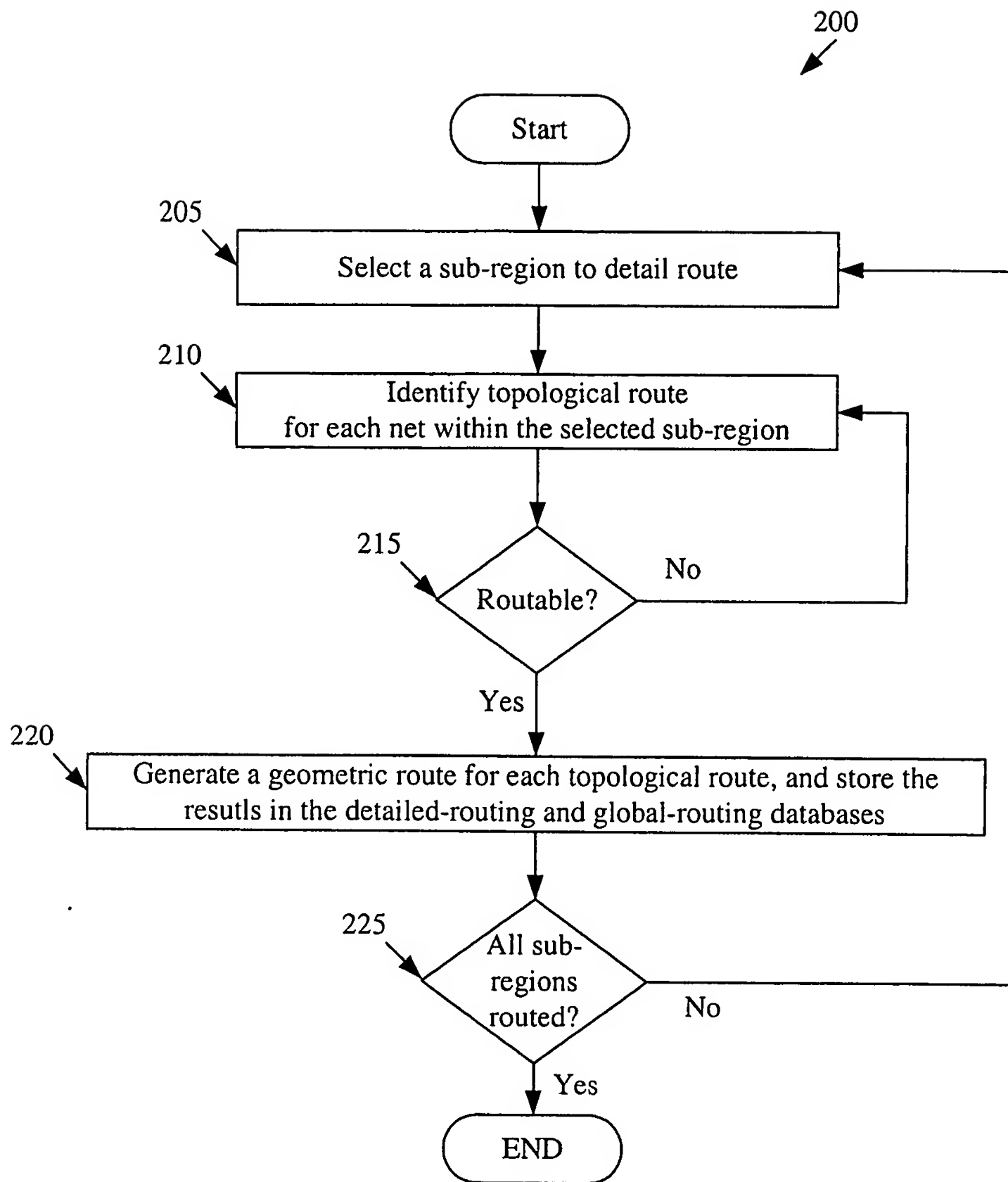
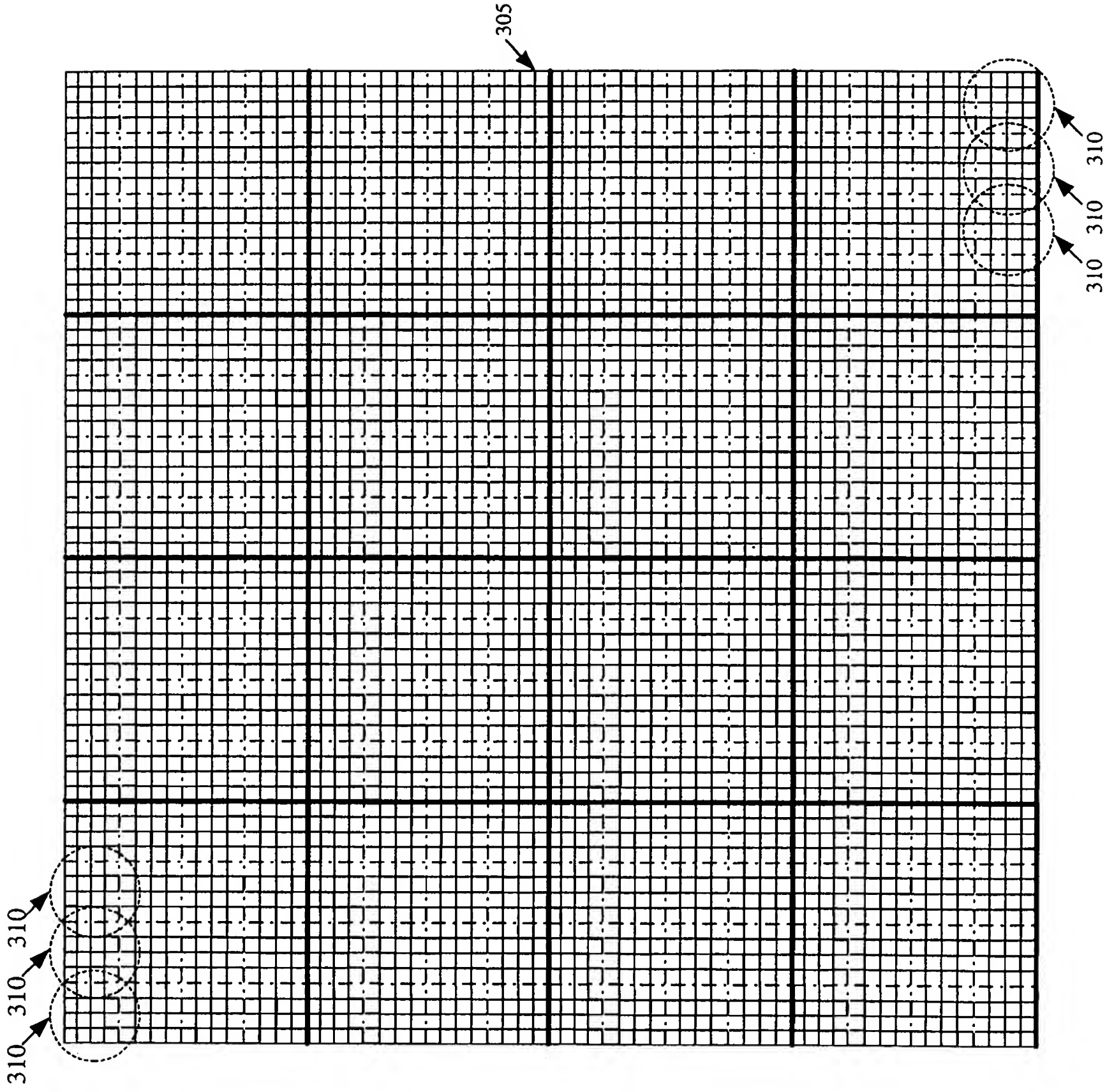


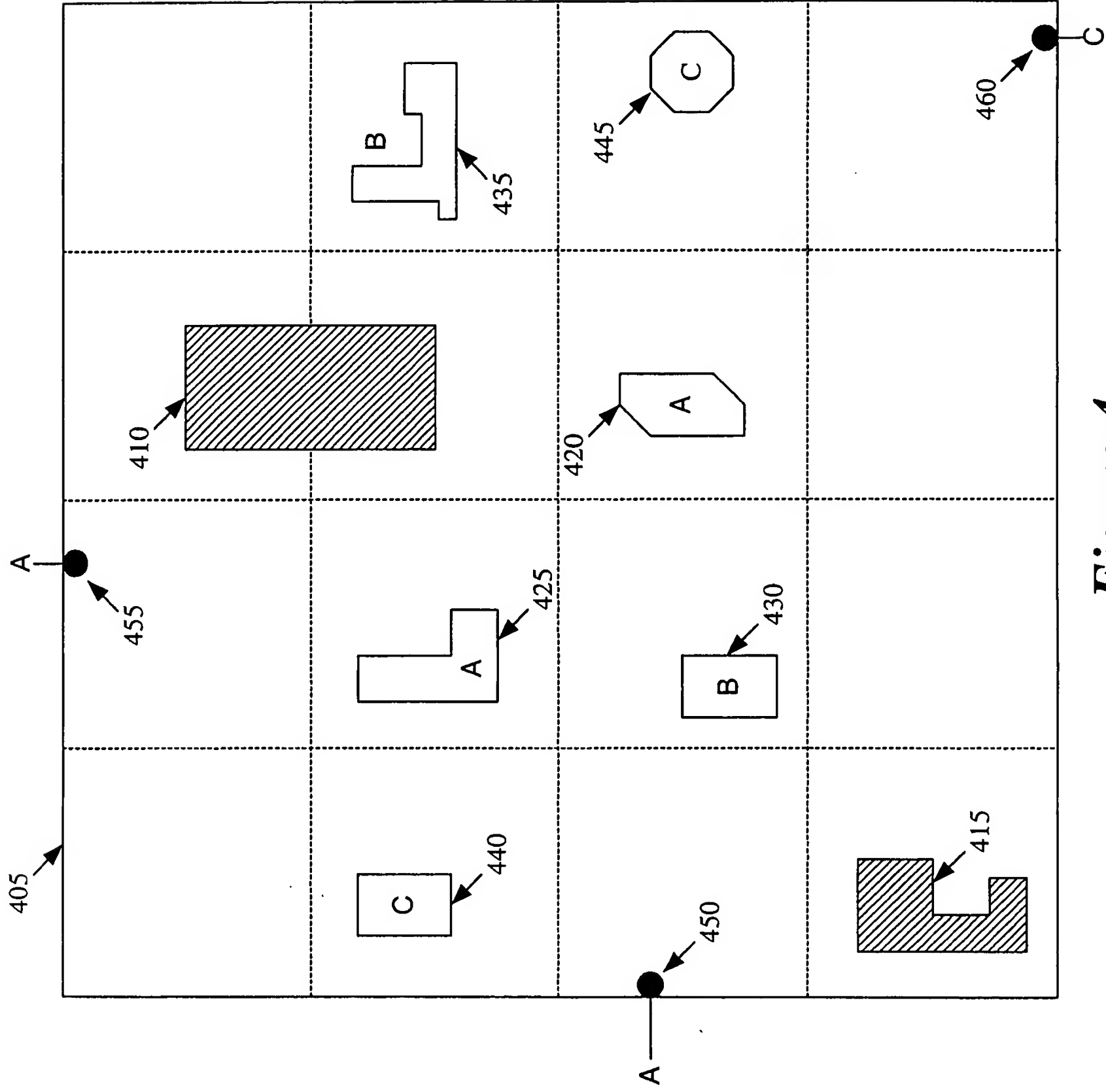
*Figure 1*



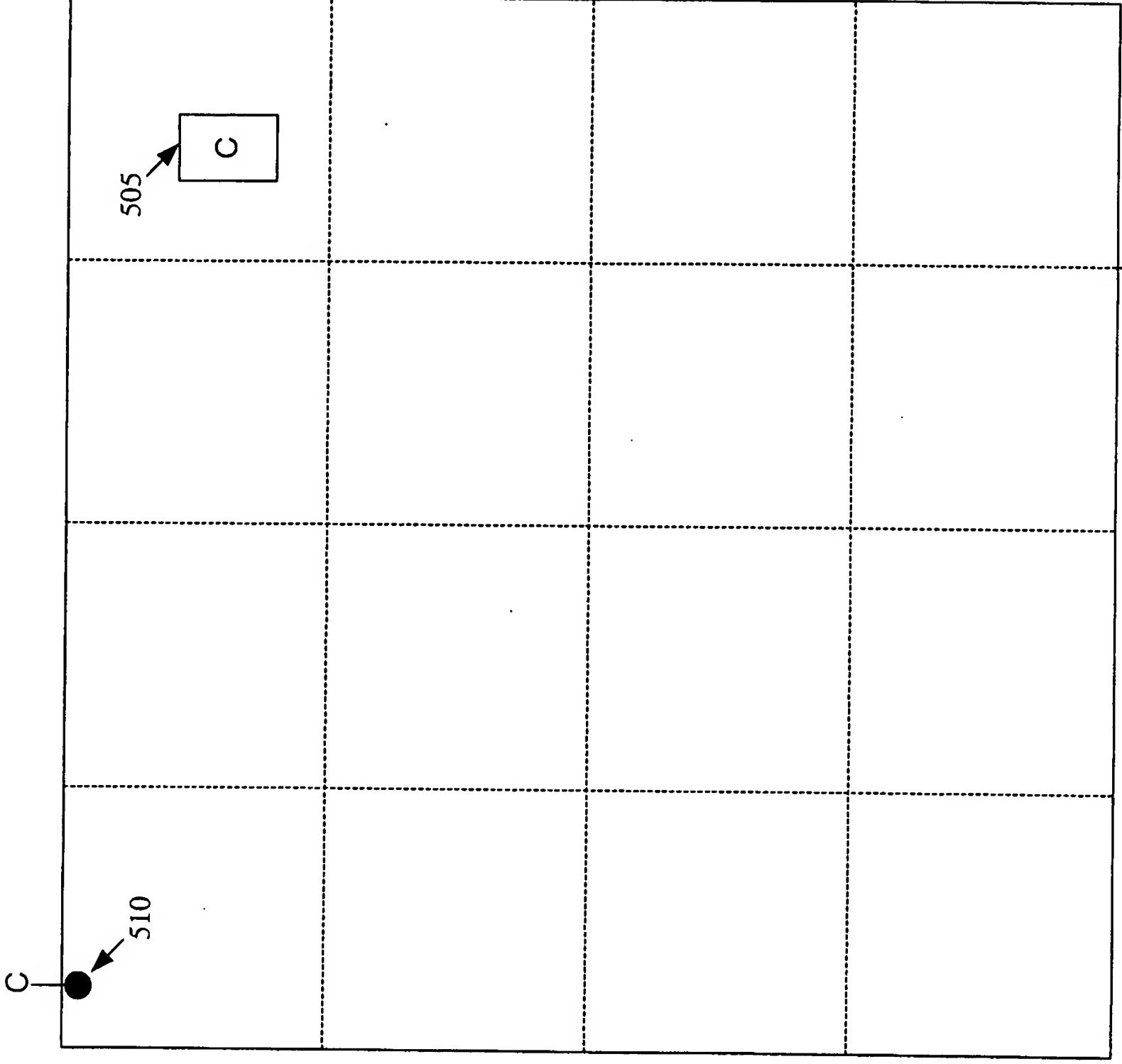
**Figure 2**



*Figure 3*



*Figure 4*



*Figure 5*

```

-List of Geometries
  --Each Geometry including a sequence of points & layer assignment
-Bounding box of the region
-Array of layer properties
  --Minimum wire size
  --Minimum spacing
  --Via sizes
  --Cost/Unit
-Netlist specifying a number of nets
  --Each net specifying a set of pins
    --Each pin specifying a set of ports
    --Each port specifying a set of geometries

```

*Figure 6*

```

-List of Geometries
  --Each Geometry including a sequence of points & layer assignment
    --List of connection nodes inside each pin geometry
-Bounding box of the region
-Array of layer properties
  --Minimum wire size
  --Minimum spacing
  --Via sizes
  --Cost/Unit
-Netlist specifying a number of nets
  --Each net specifying a set of pins
    --Each pin specifying a set of ports
      --Each port specifying a set of geometries
-For each layer, a graph specifying
  --Nodes
  --Edges
  --Faces

```

*Figure 7*

Face
<ul style="list-style-type: none"> <li>-Reference to 3 edges</li> <li>-Reference to 3 nodes</li> <li>-Up to two references for up to two face item</li> </ul>

800

Edge
<ul style="list-style-type: none"> <li>-Two references for up to two faces of the edge</li> <li>-Capacity</li> <li>-Flow</li> <li>-Constrained</li> <li>-Linked list of items on the edge starting with one of the edge's nodes and ending with its other node</li> </ul>

900

Figure 8

Figure 9

Node
<ul style="list-style-type: none"> <li>-Net Identifier</li> <li>-One or more planar-path references to adjacent topological items in the same planar path</li> <li>-A pair of via-path references to up and down topological via items</li> <li>-A references to list of edges connected to the node</li> <li>-For each edge, an edge reference to the next or previous topological item on the edge</li> <li>-A reference to the geometry of the node</li> <li>-Vertex number identifying the vertex of the geometry</li> <li>-Location of the node</li> </ul>

1000

*Figure 10*

Edge Item
<ul style="list-style-type: none"> <li>-Reference to its edge</li> <li>-Net Identifier</li> <li>-A pair of planar-path references to adjacent topological items in the same planar path</li> <li>-A pair of edge references to the next and previous topological item on the edge</li> </ul>

1100

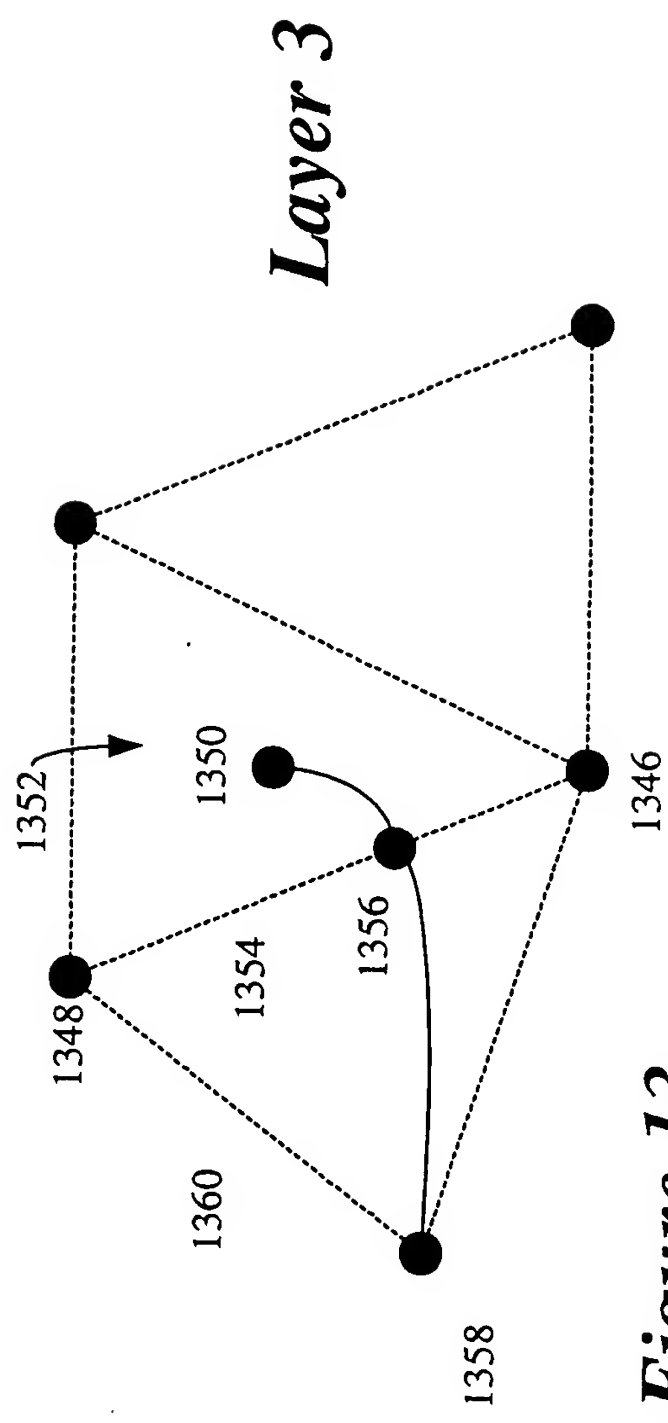
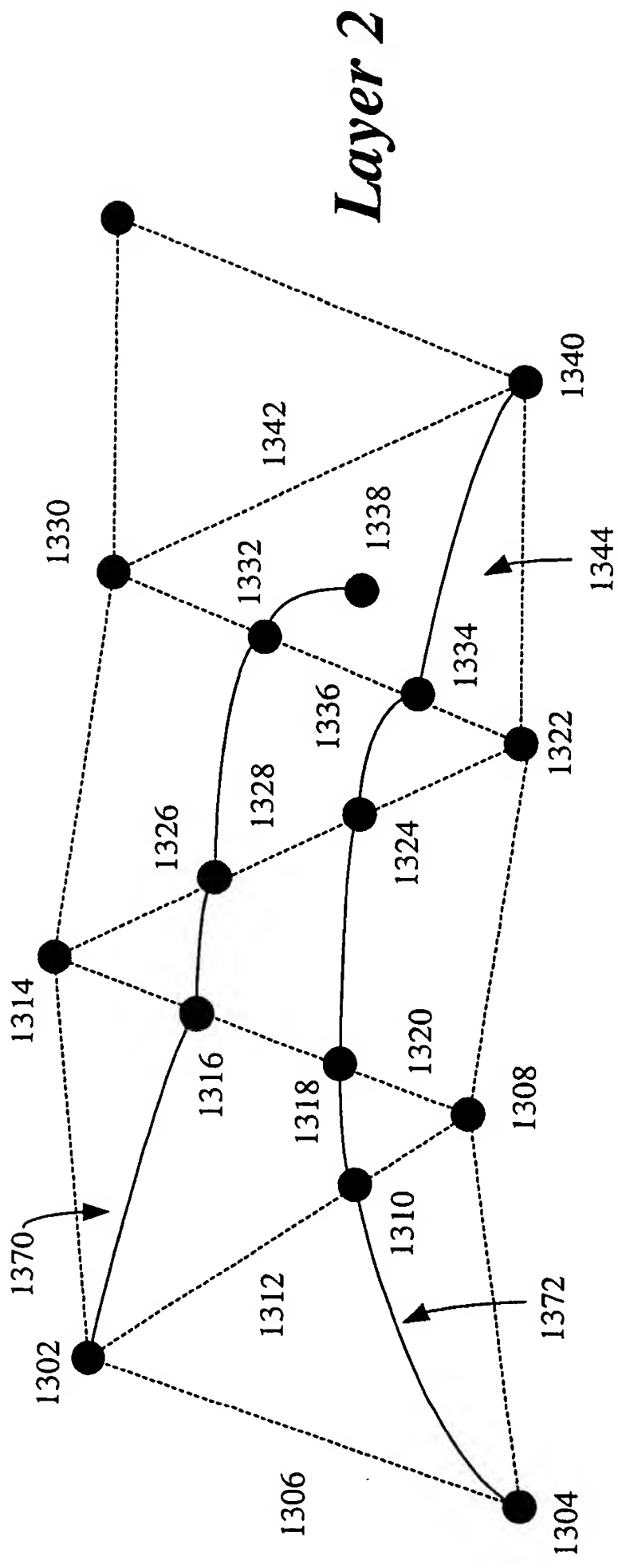
*Figure 11*

Face Item
<ul style="list-style-type: none"> <li>-Reference to its face</li> <li>-Net Identifier</li> <li>-Up to 3 planar-path references for adjacent topological items in the same planar path</li> <li>-A pair of via-path references for up and down topological via items</li> <li>-Bounding polygon that defines legal face item locations</li> <li>-Constraining Points and Distances</li> </ul>

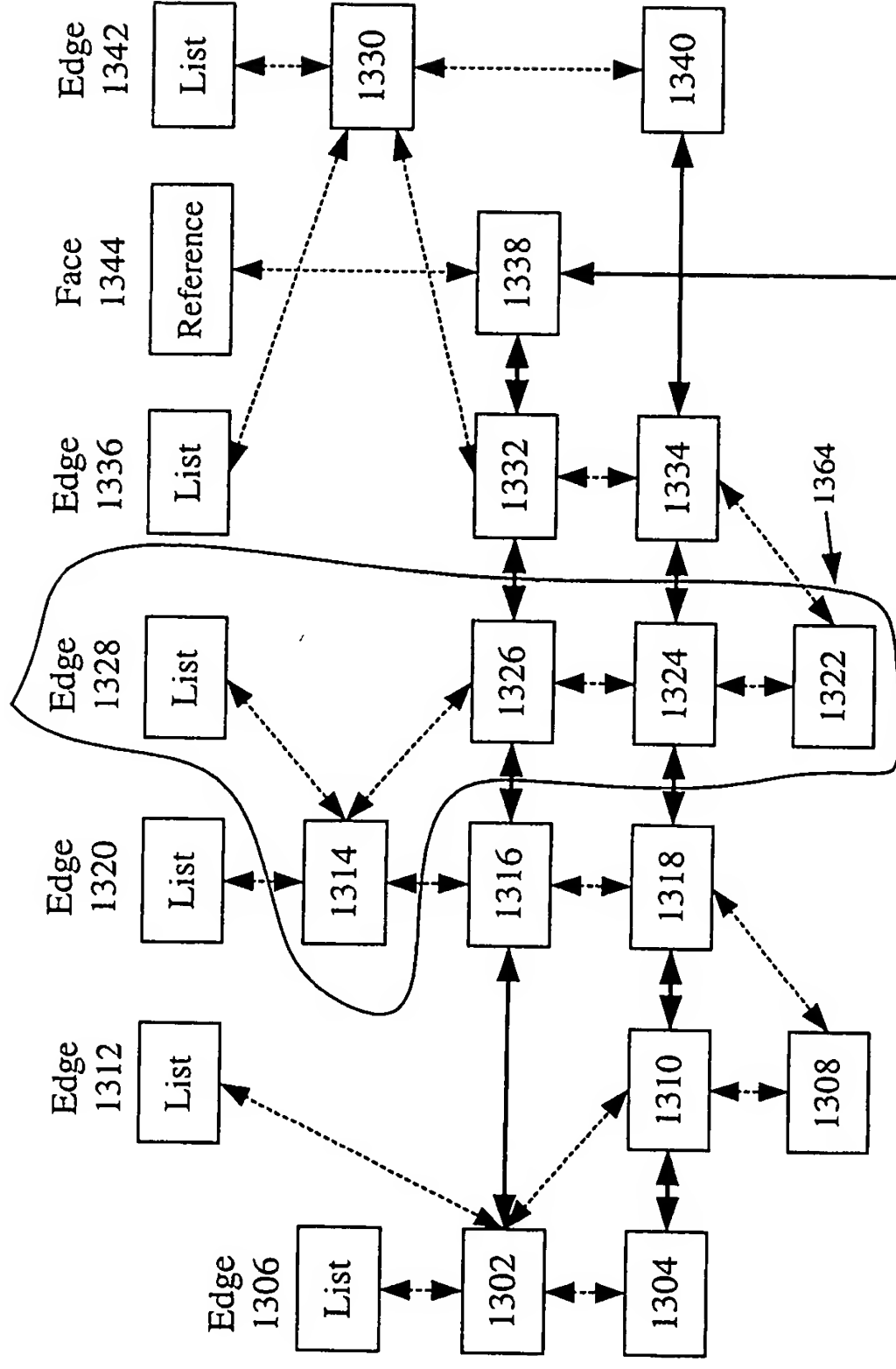
1200

*Figure 12*

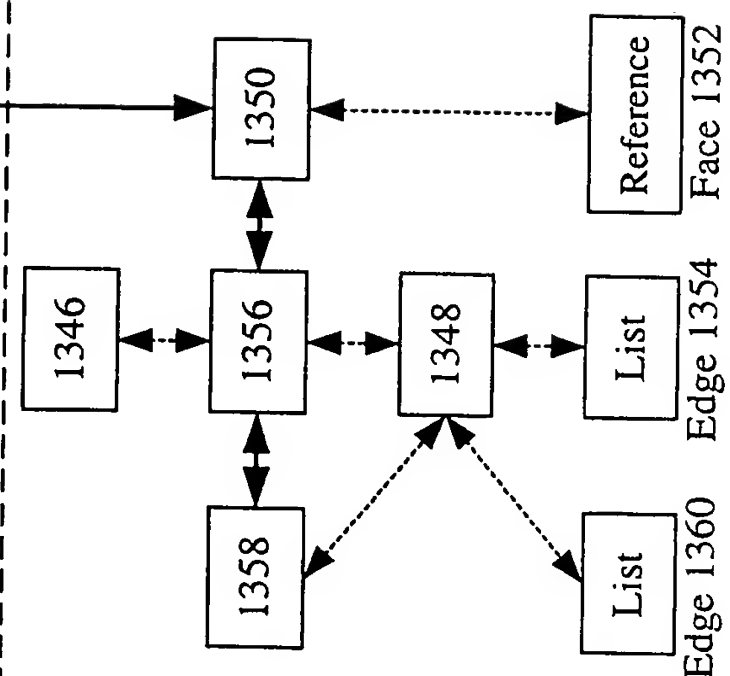




*Figure 13*

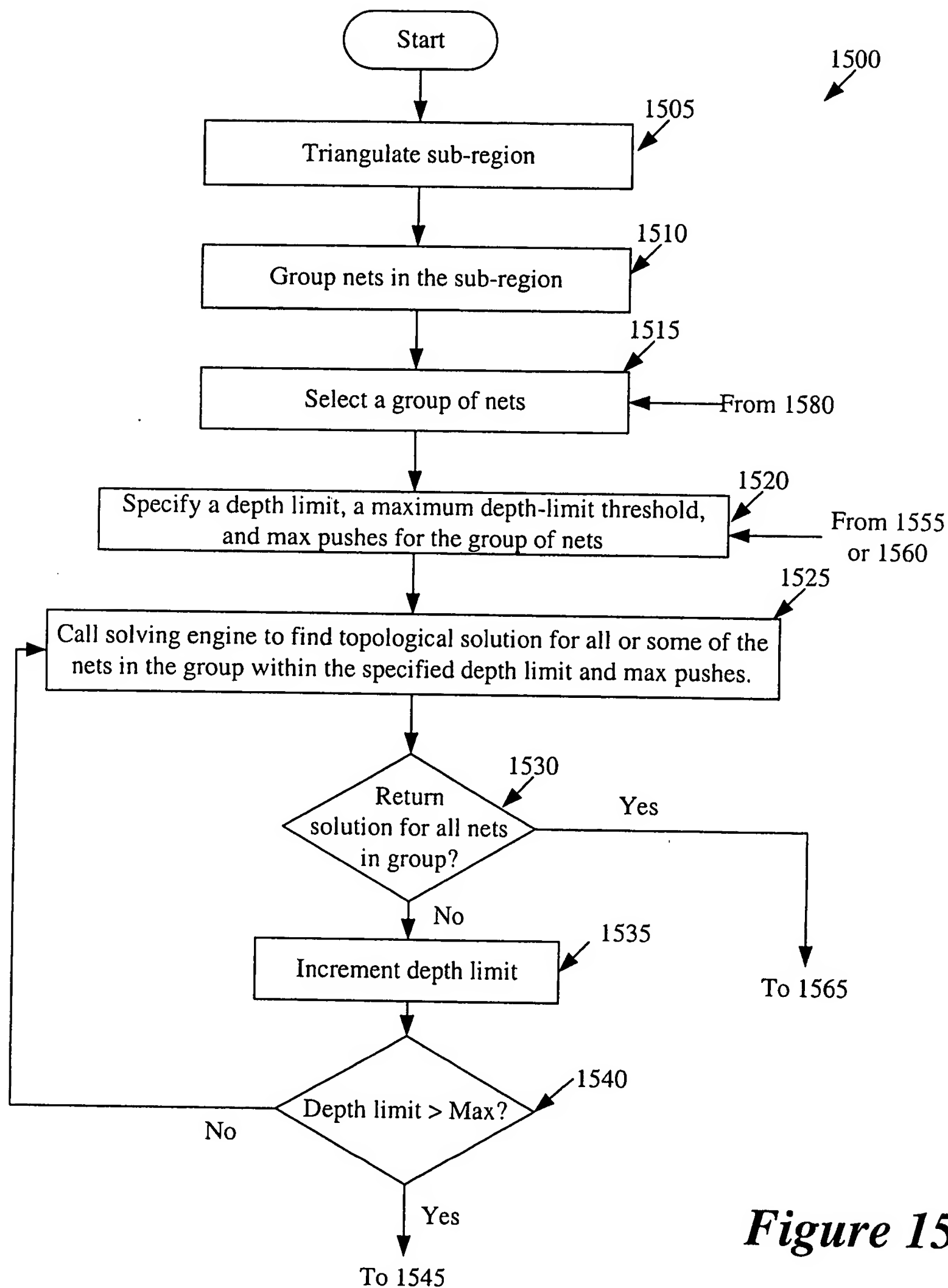


*Layer 2*



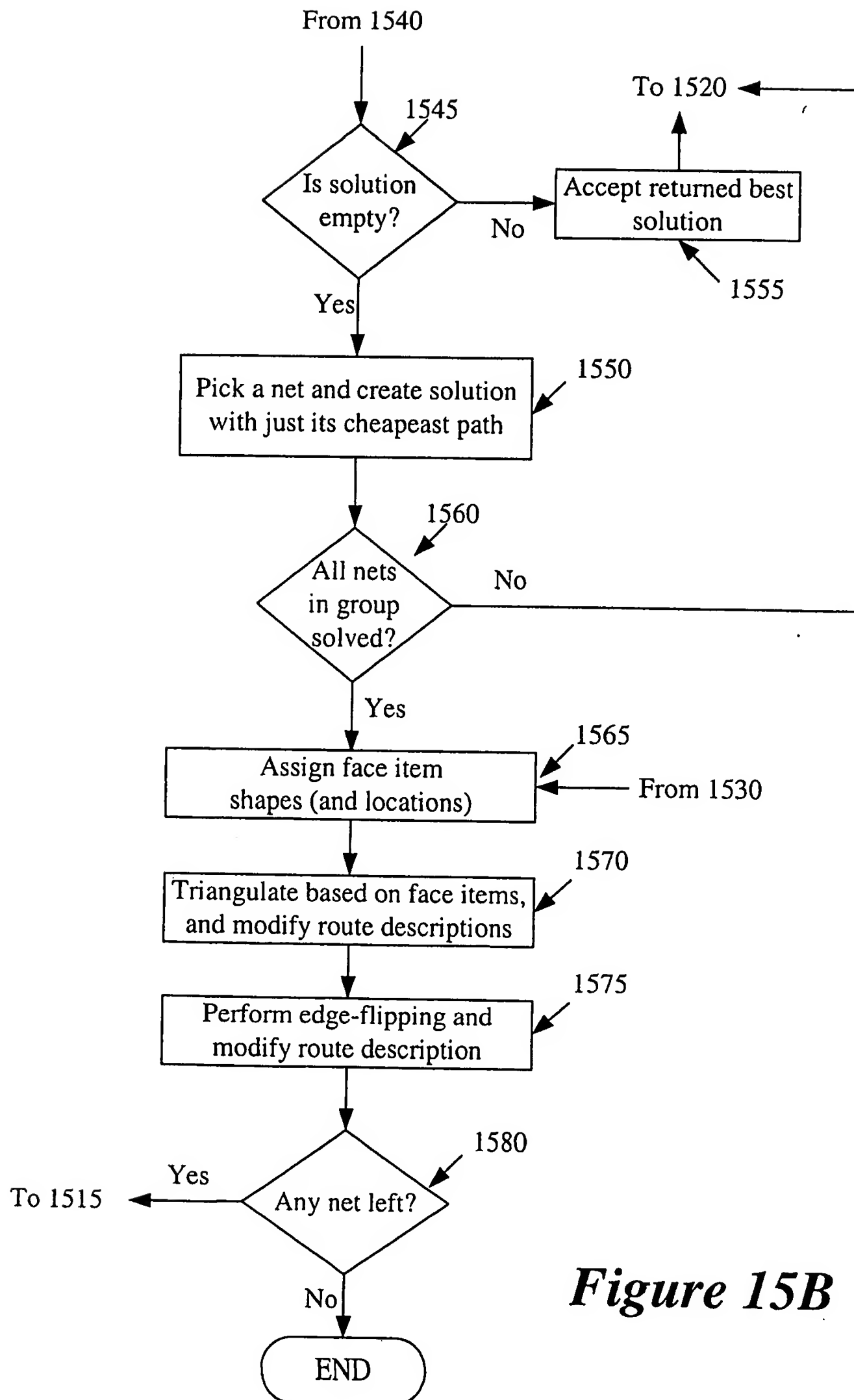
*Layer 3*

*Figure 14*

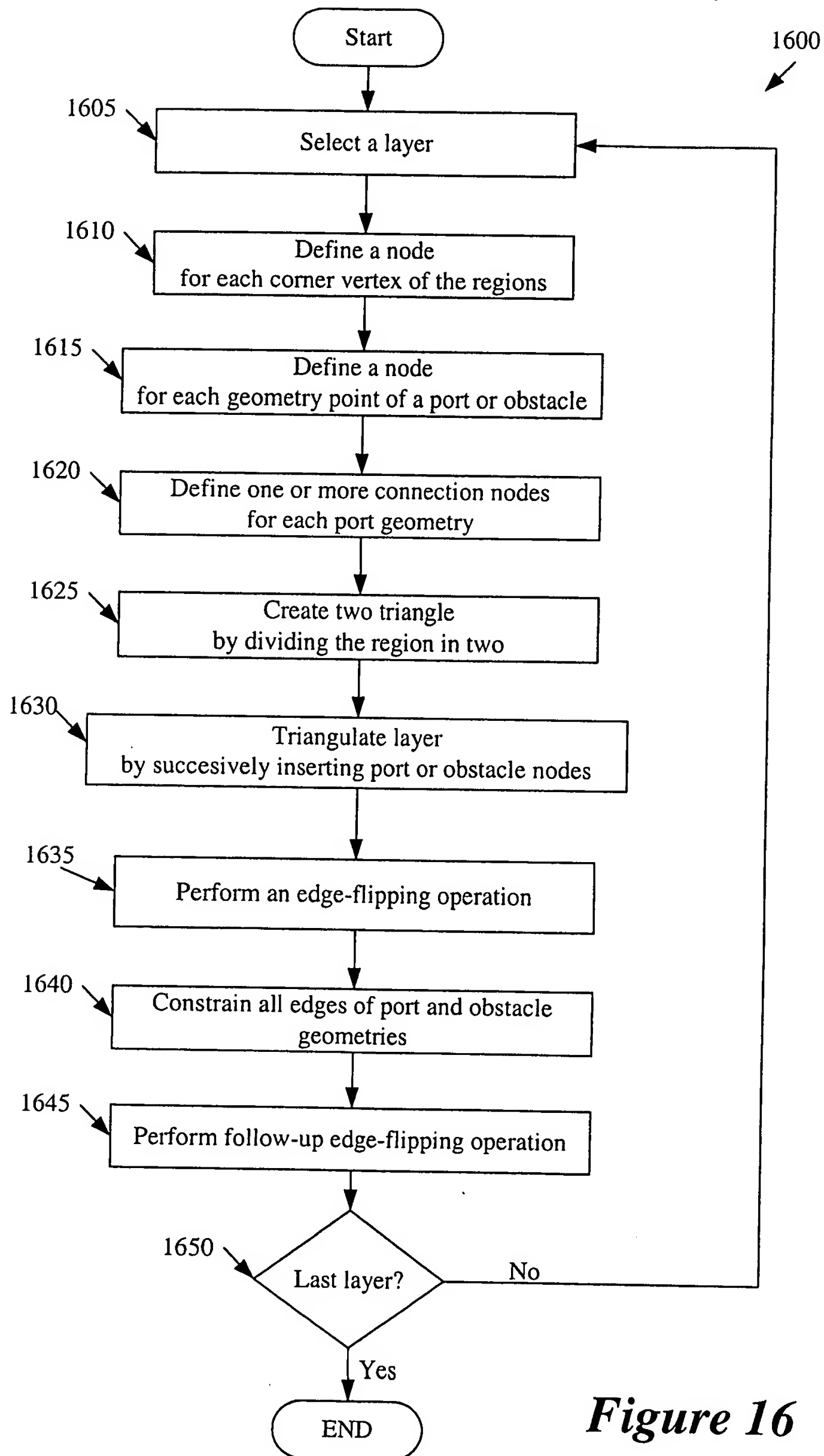


**Figure 15A**

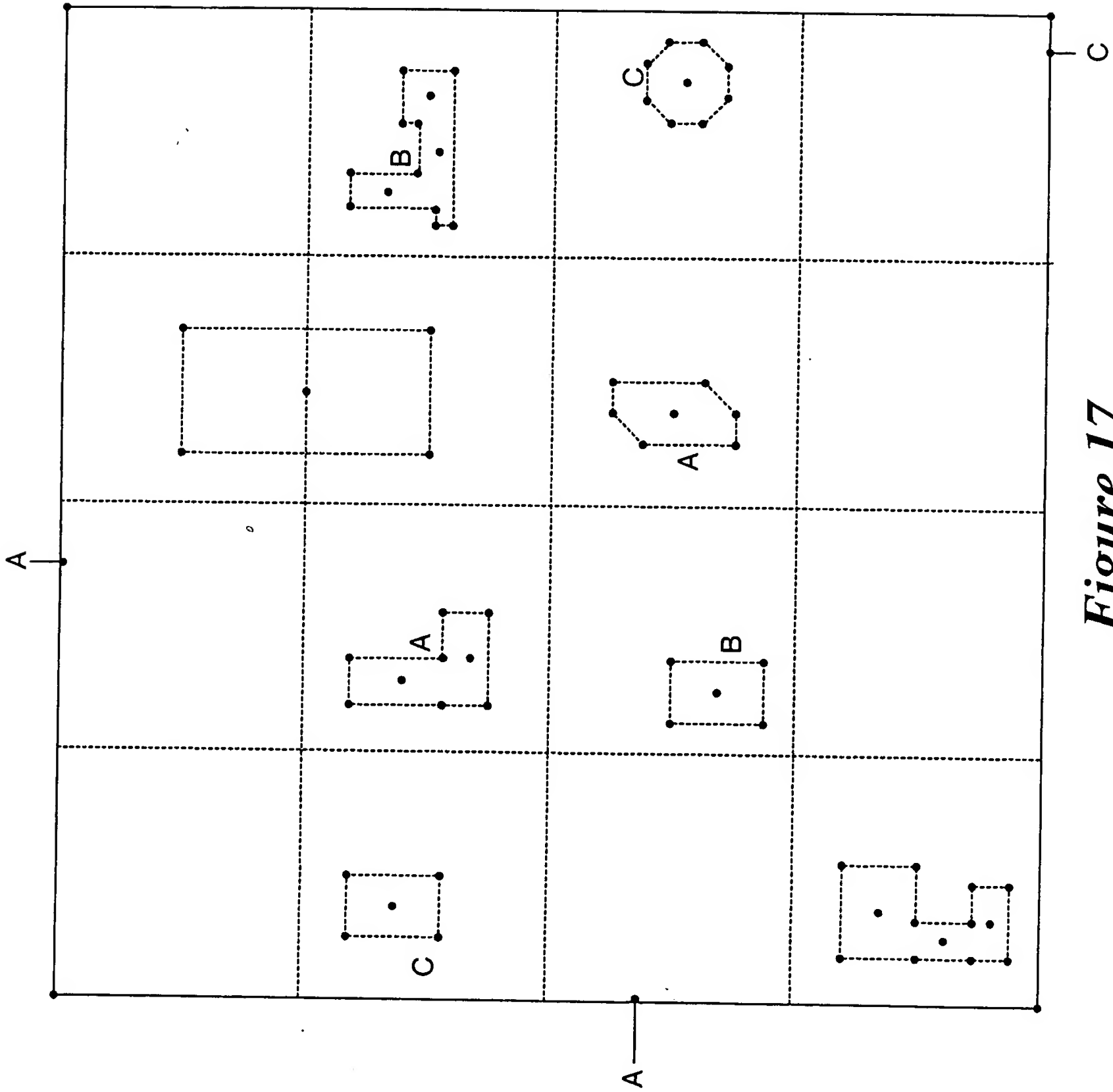
**Figure 15:** Figure 15A  
Figure 15B



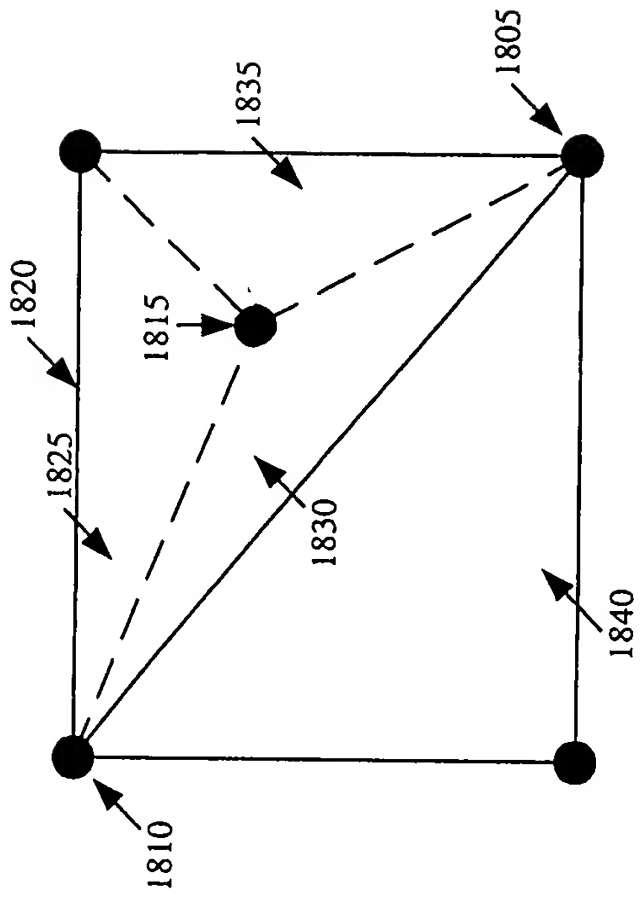
**Figure 15B**



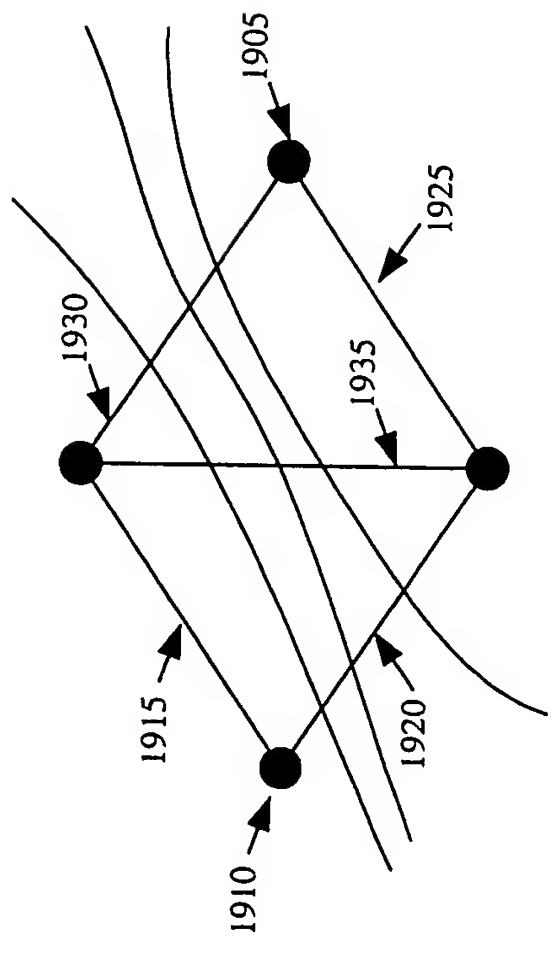
**Figure 16**



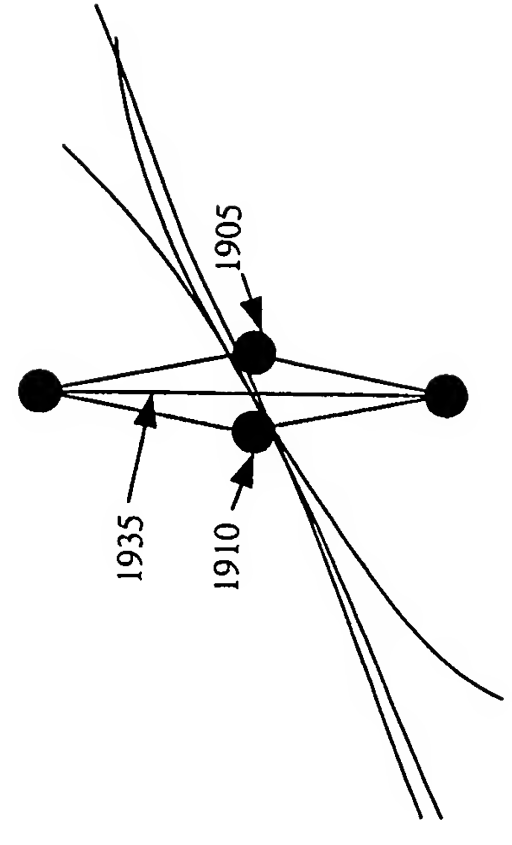
*Figure 17*



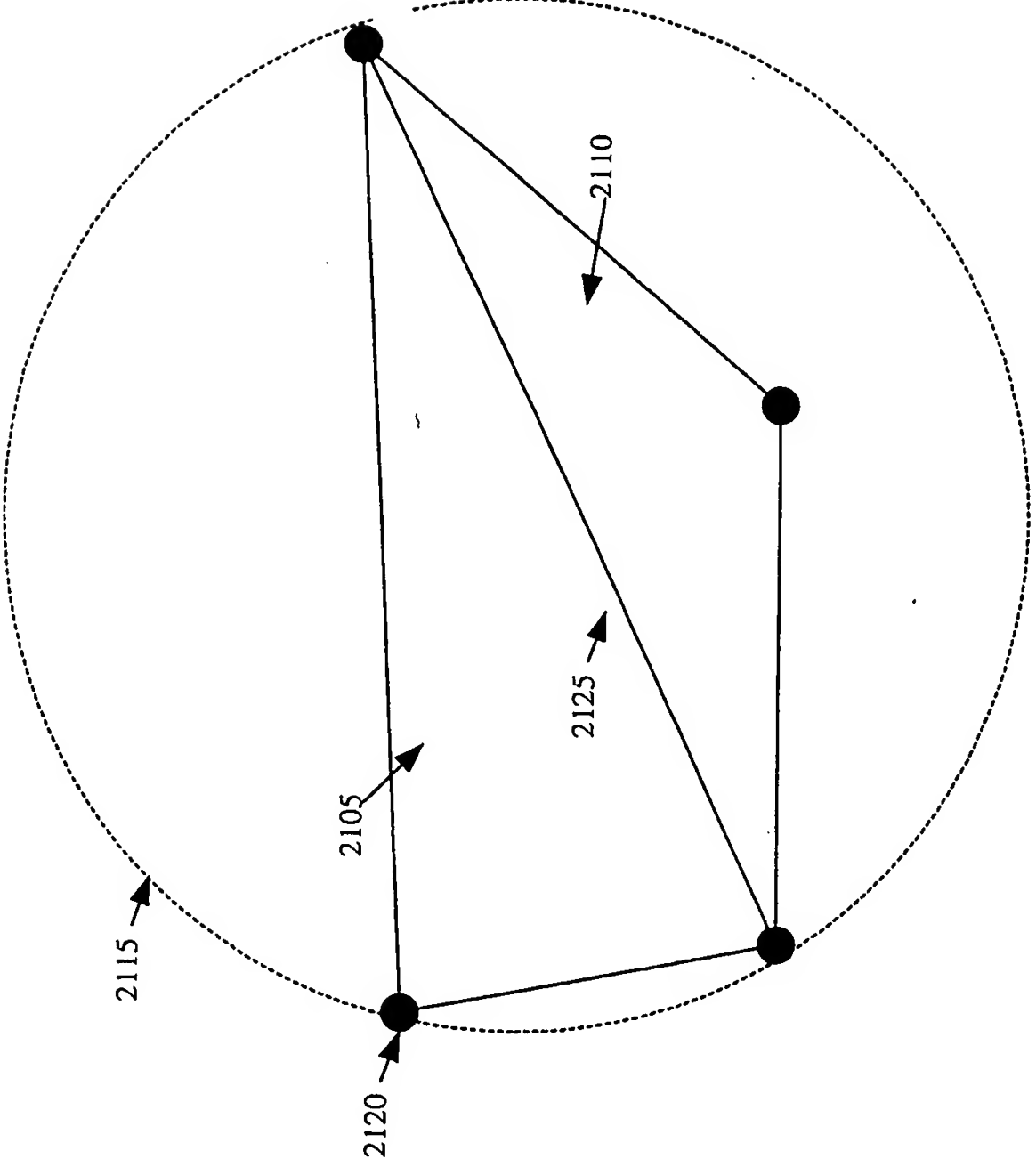
*Figure 18*



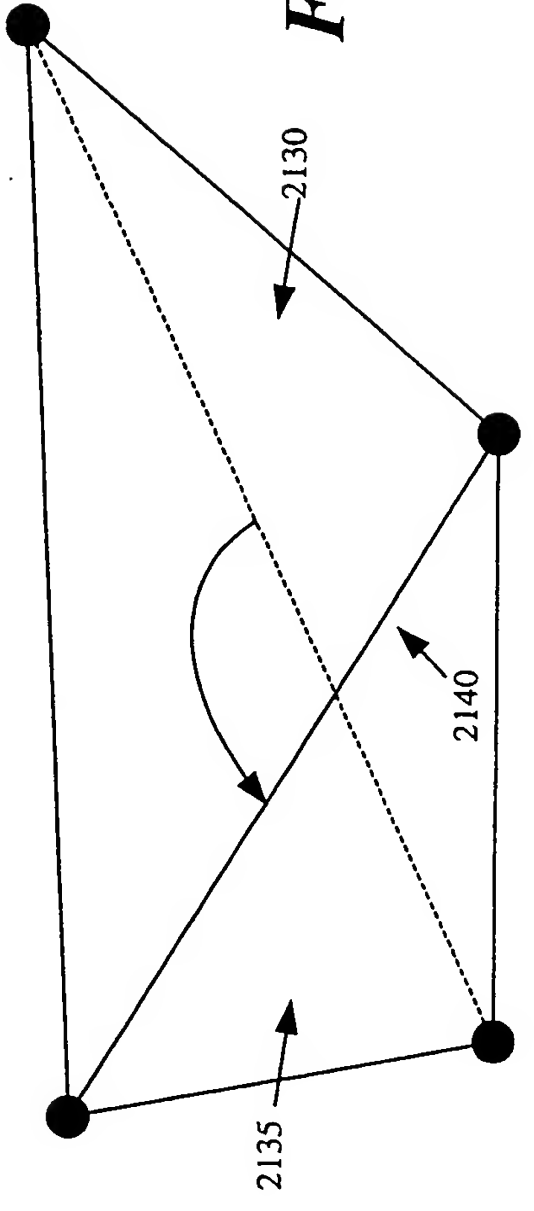
*Figure 19*



*Figure 20*

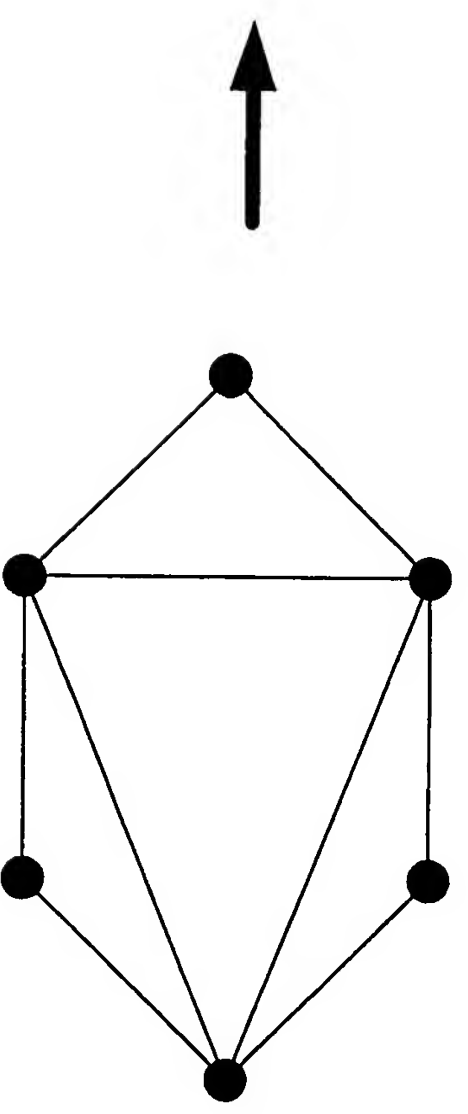
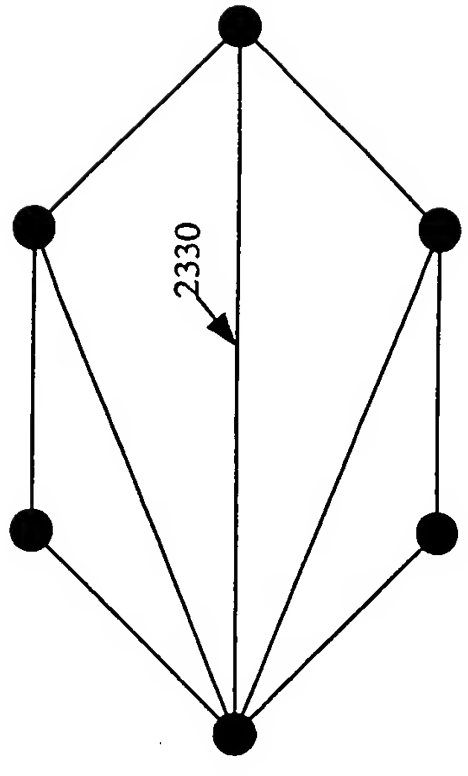
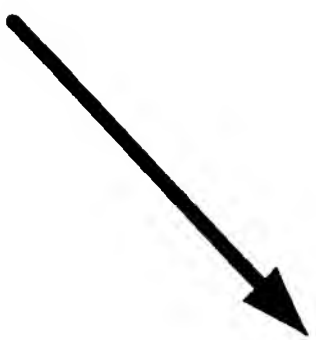
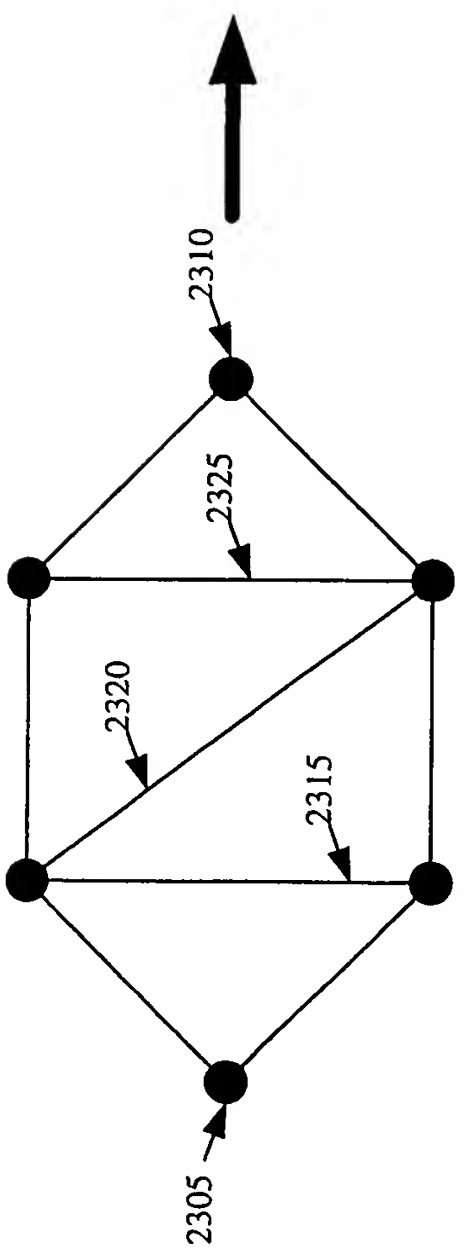
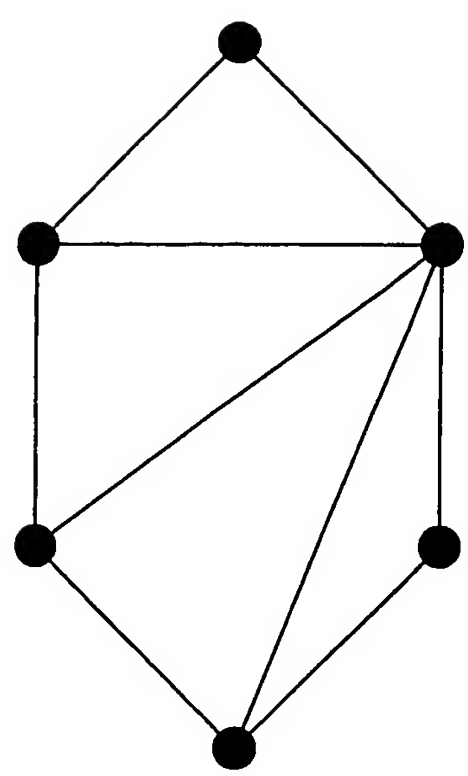


*Figure 21*

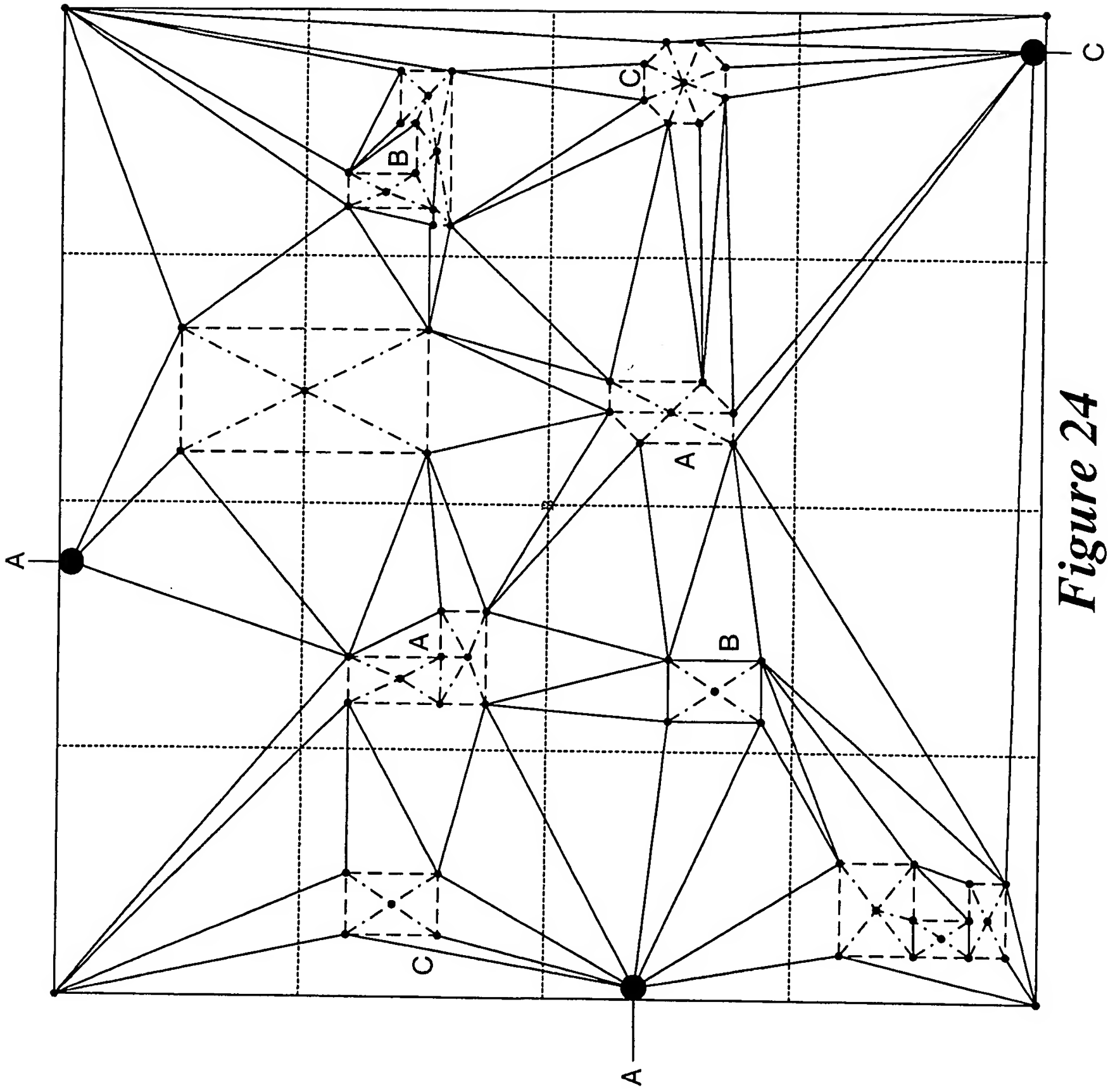


*Figure 22*

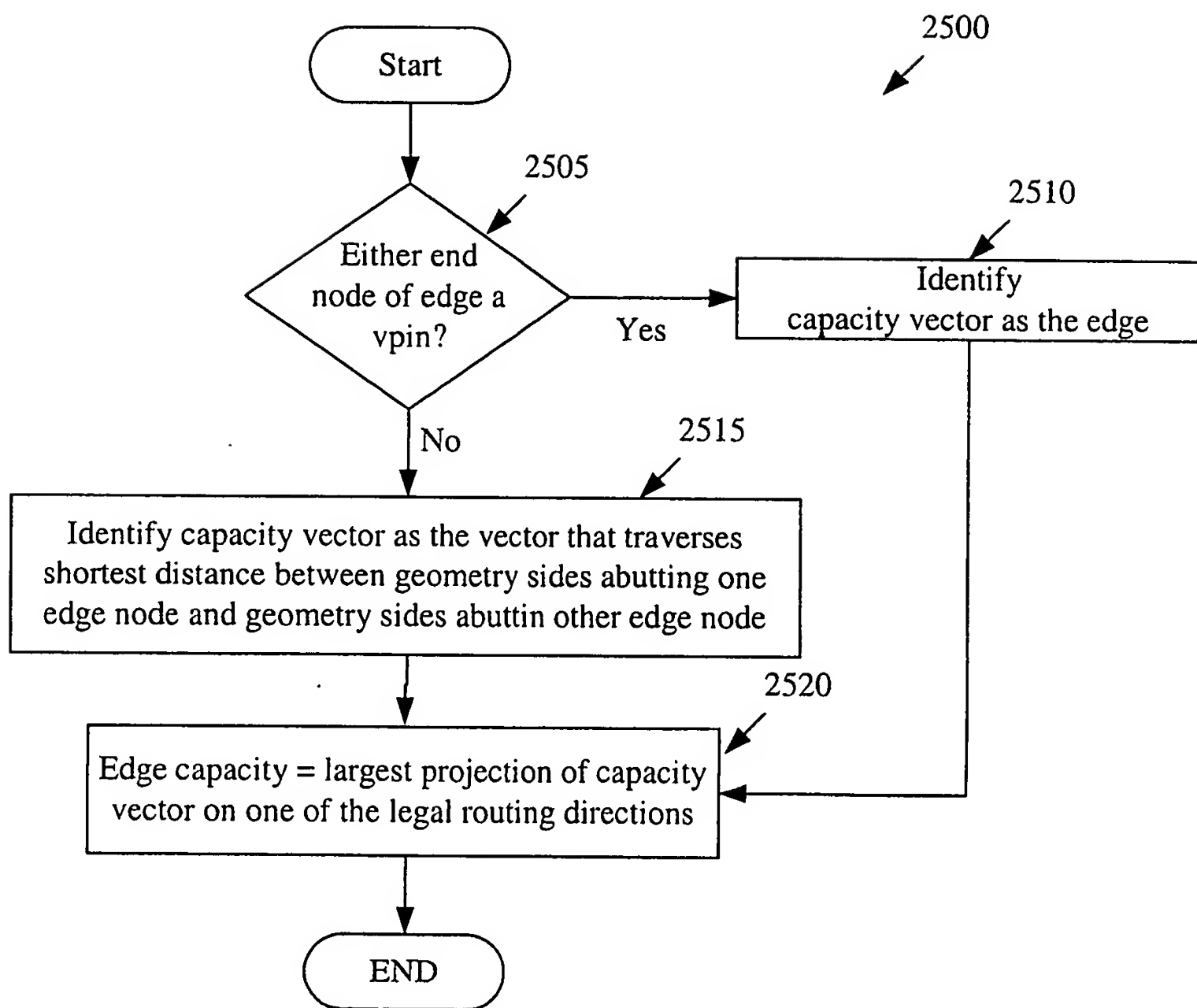




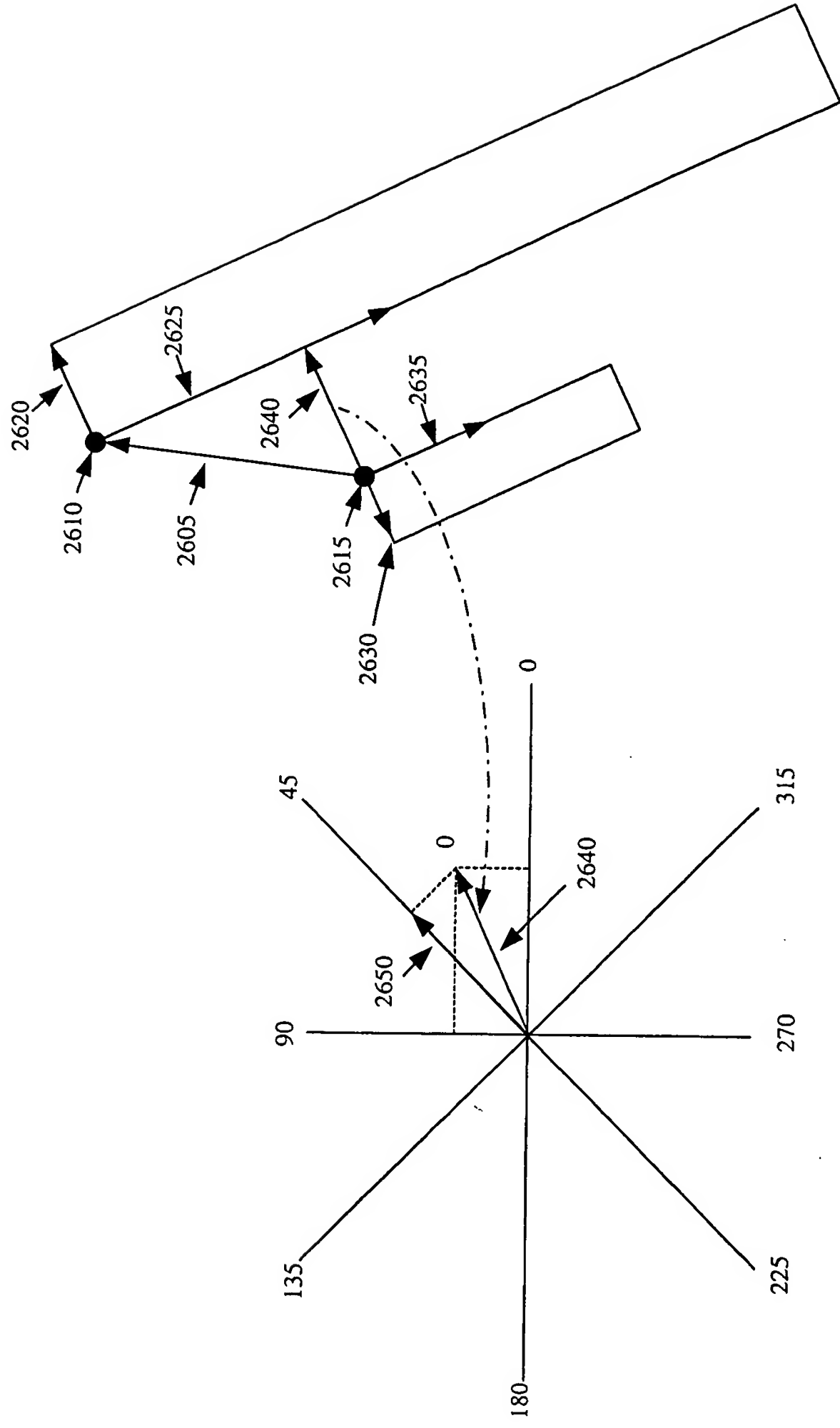
*Figure 23*



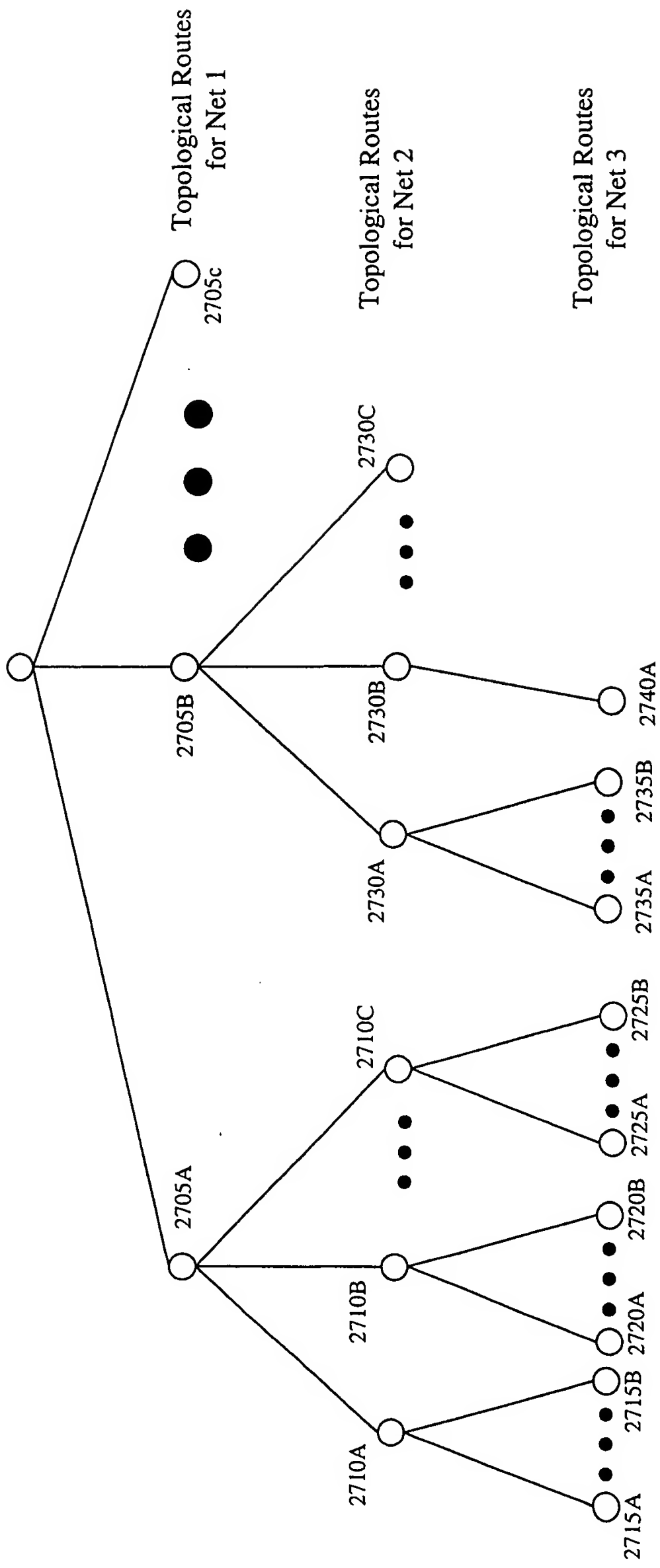
*Figure 24*



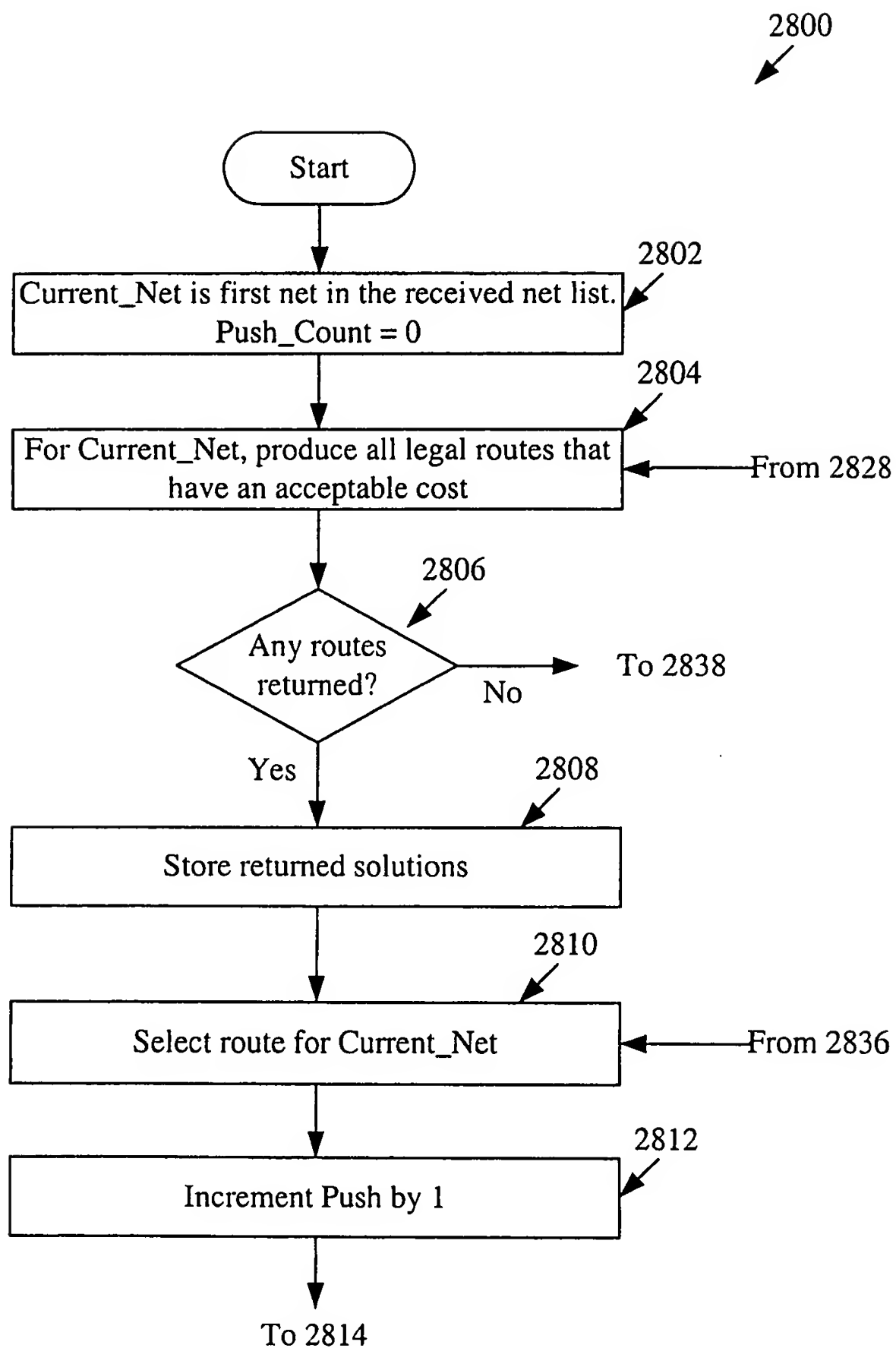
**Figure 25**



*Figure 26*

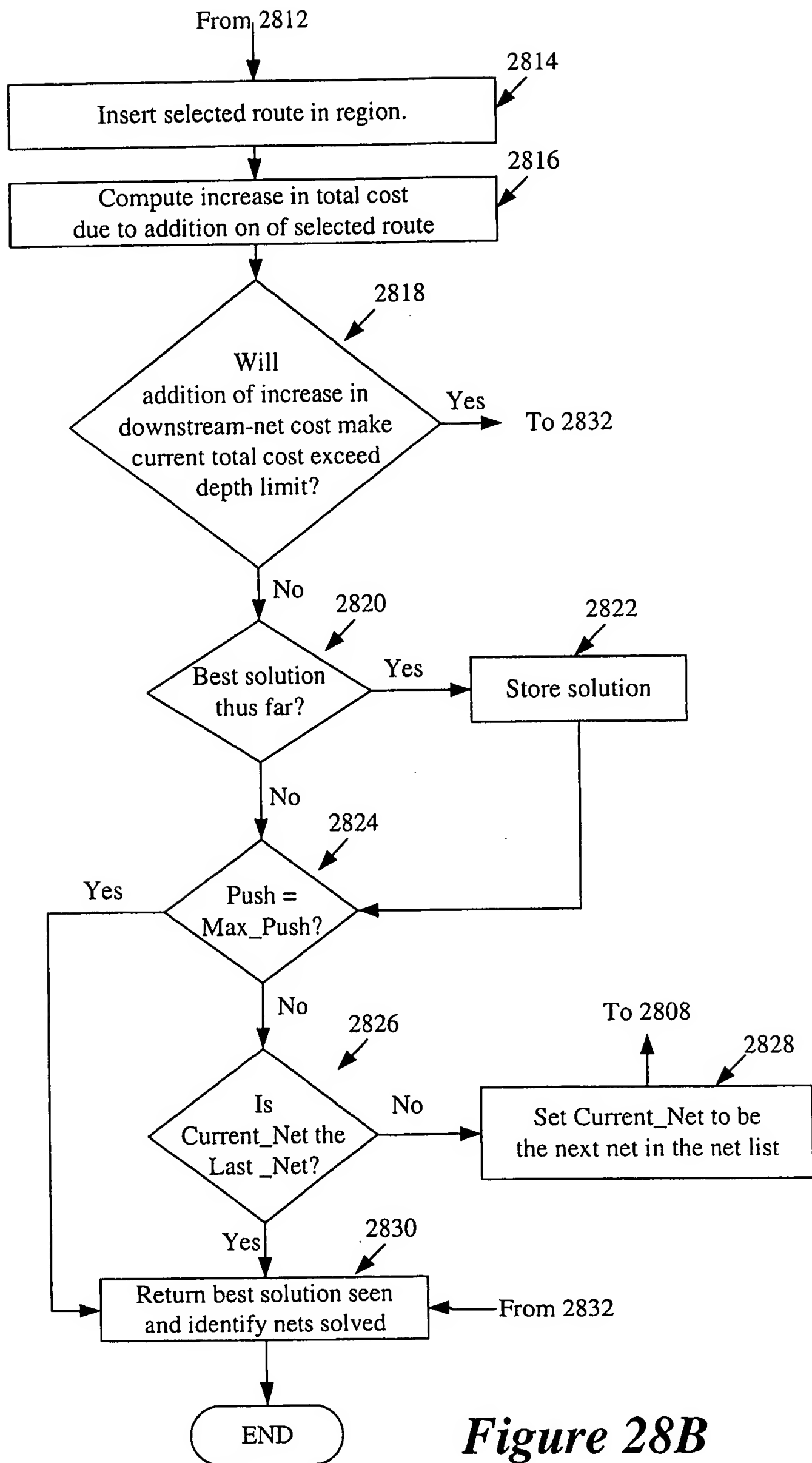


*Figure 27*

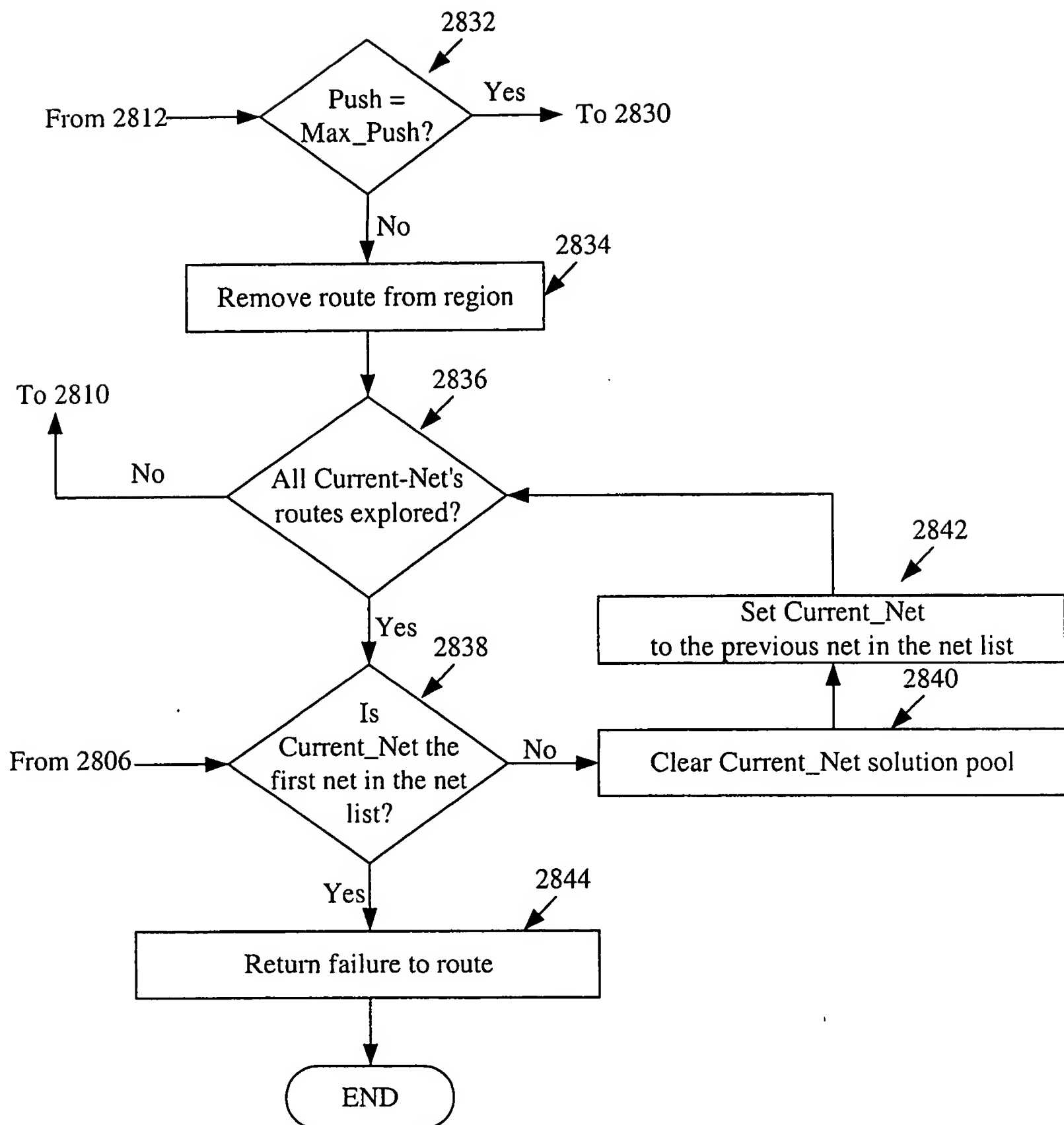


**Figure 28A**

**Figure 28:**  $\frac{\text{Figure 28A}}{\frac{\text{Figure 28B}}{\text{Figure 28C}}}$

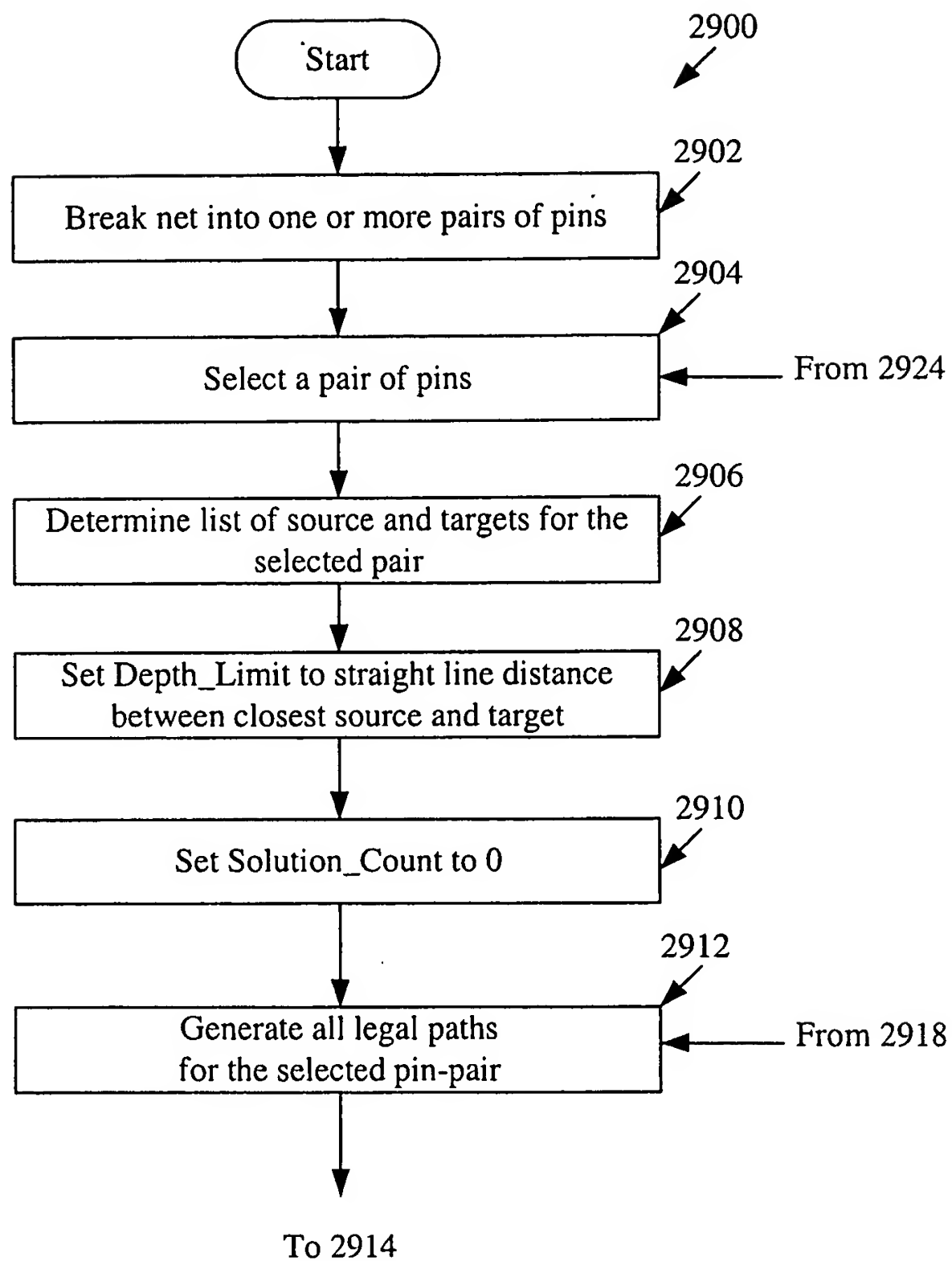


**Figure 28B**



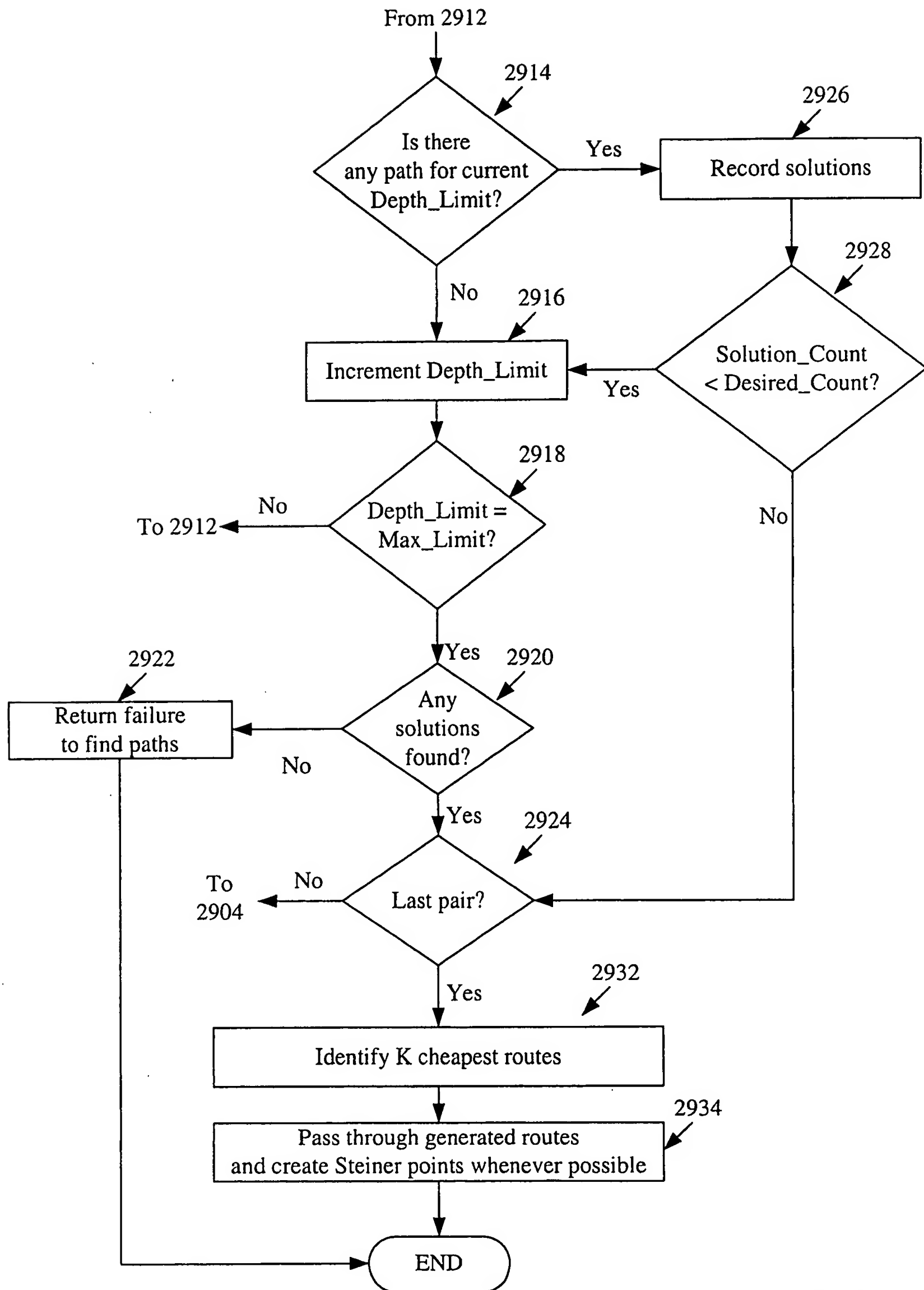
**Figure 28C**



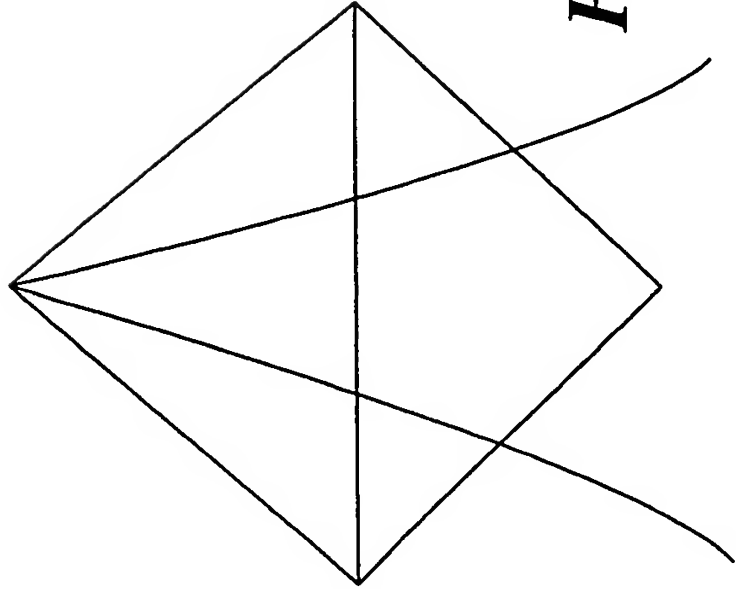


**Figure 29A**

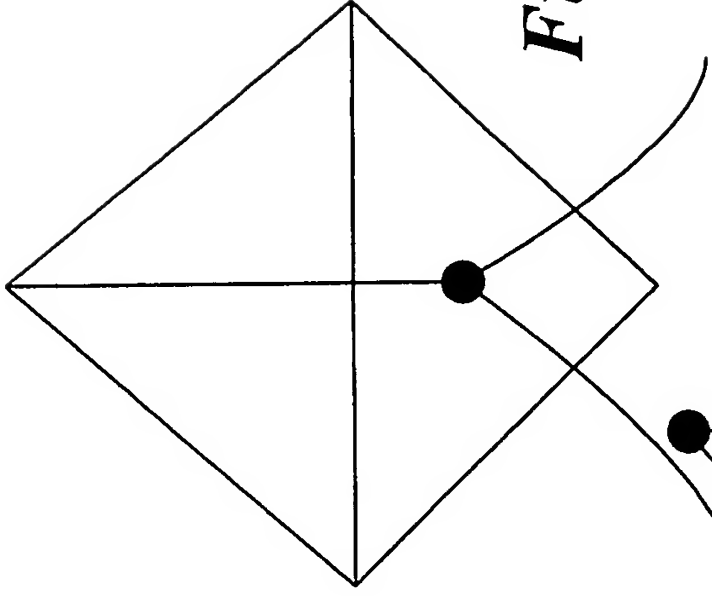
**Figure 29:**  $\frac{\text{Figure 29A}}{\text{Figure 29B}}$



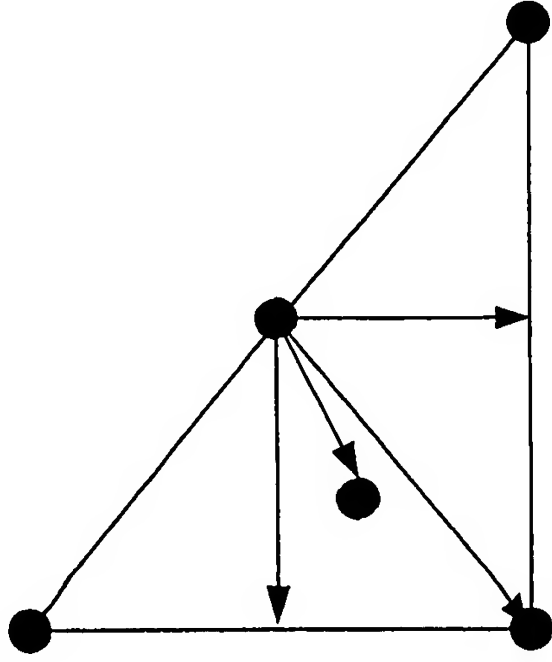
**Figure 29B**



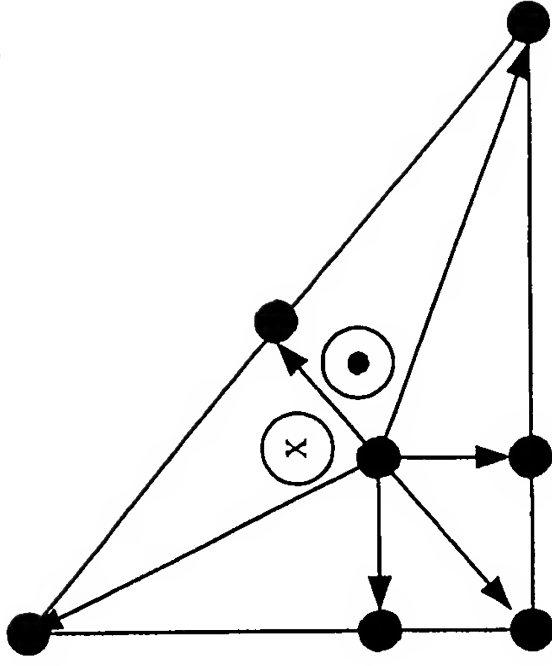
*Figure 30A*



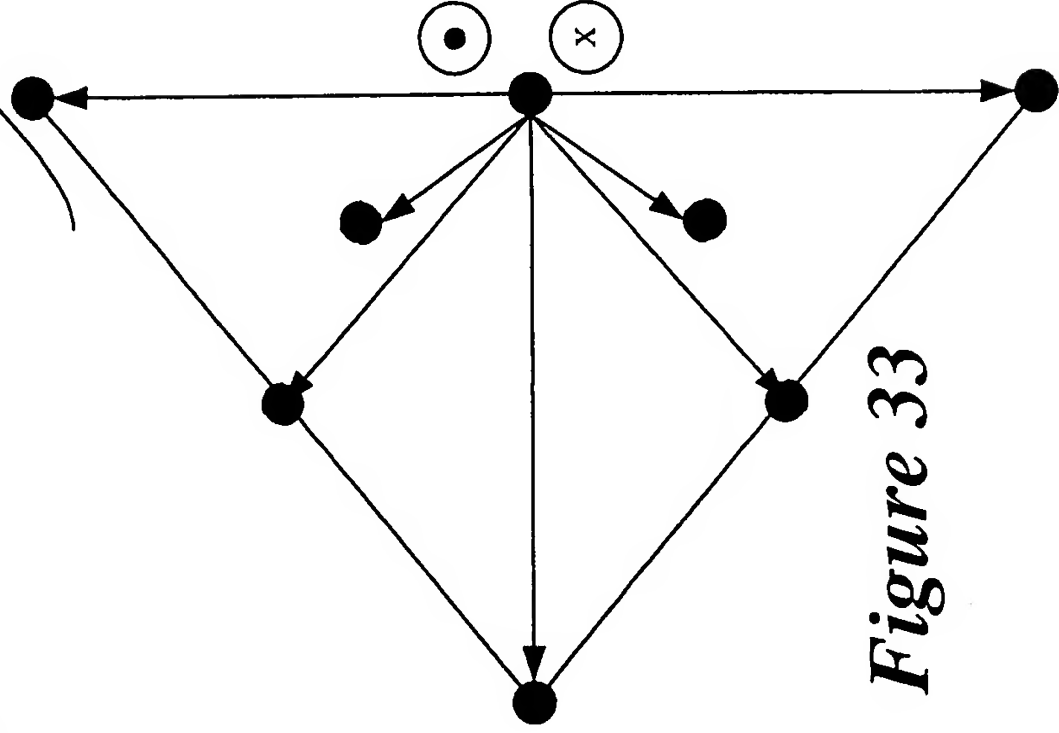
*Figure 30B*



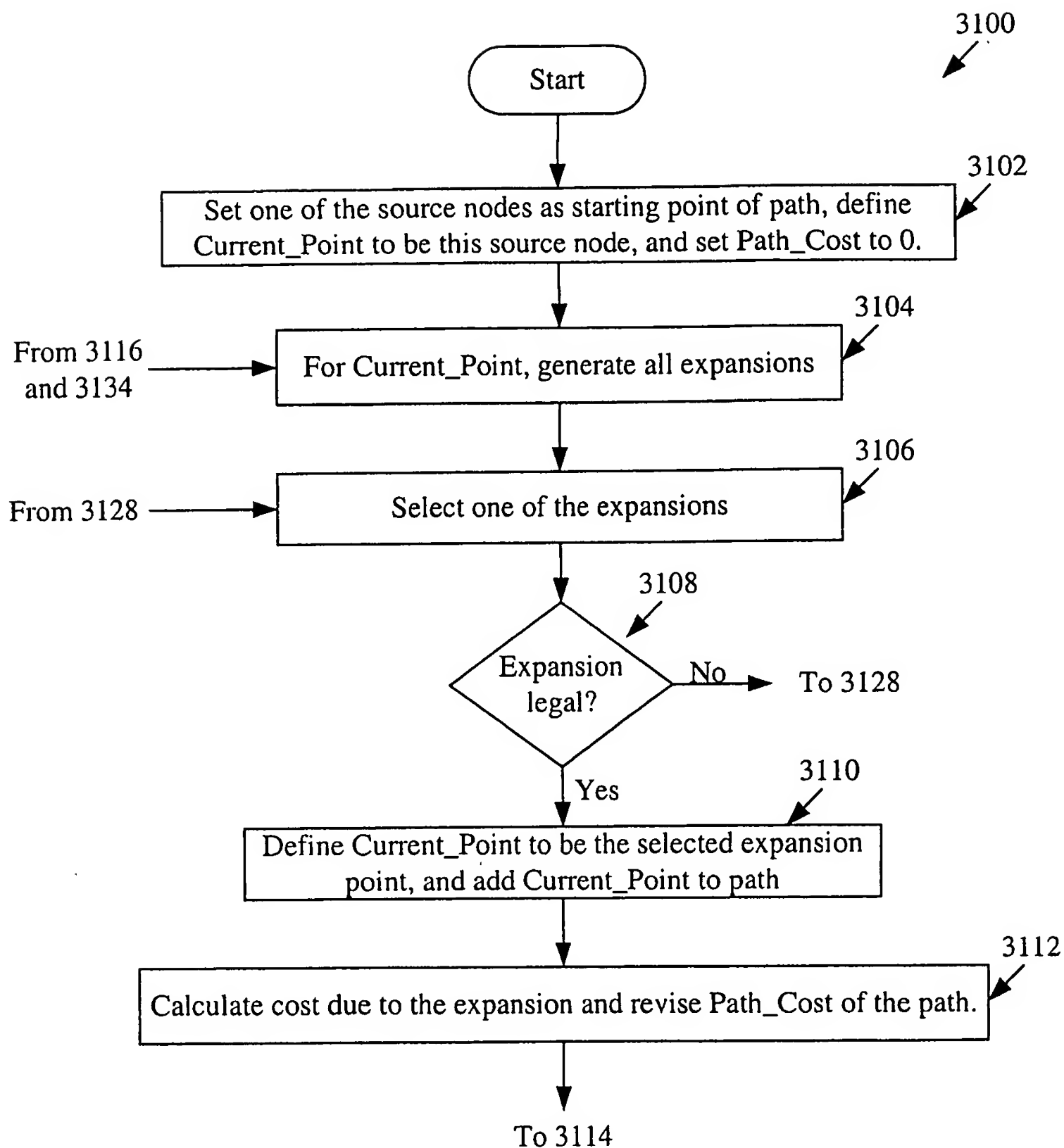
*Figure 32*



*Figure 34*

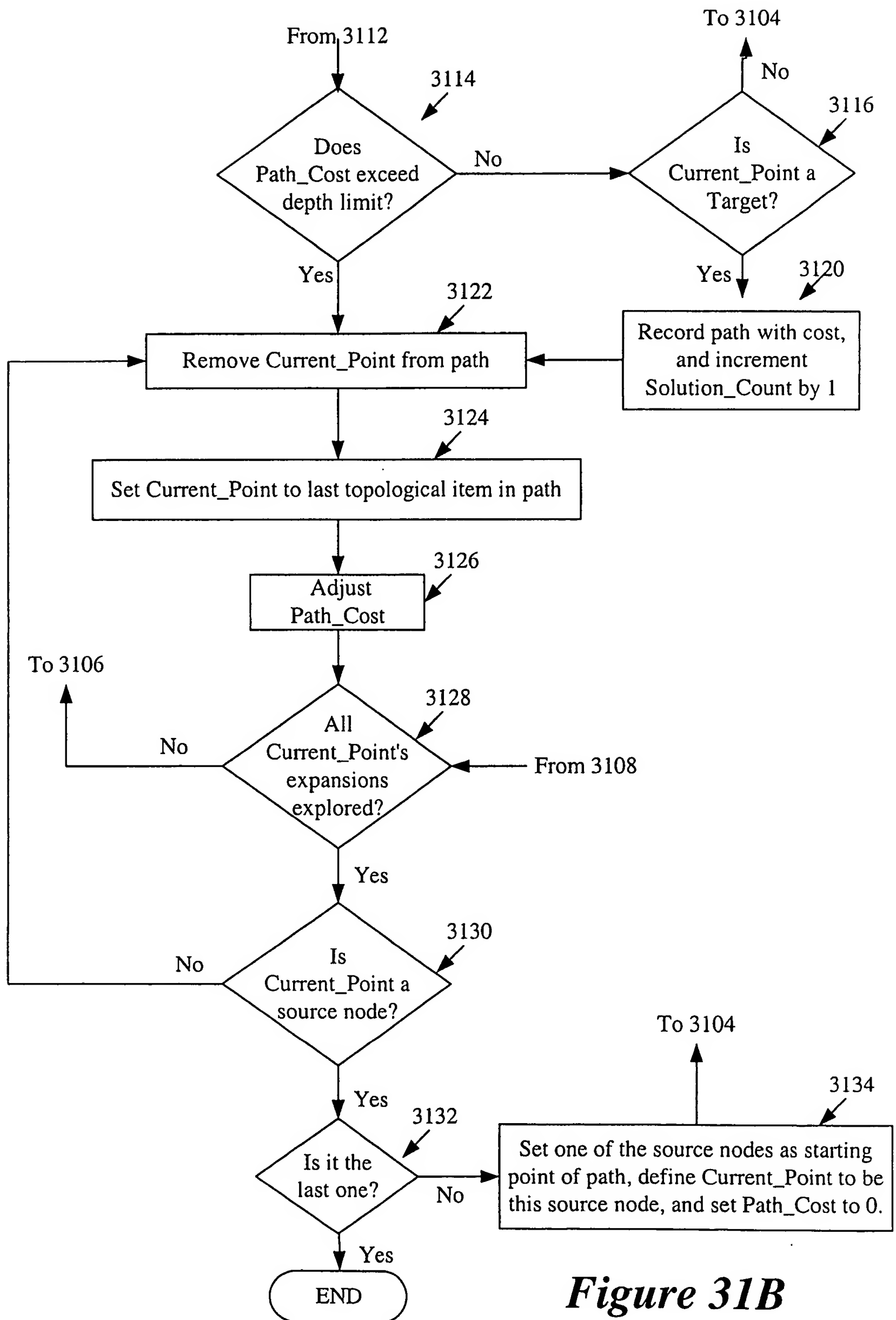


*Figure 33*

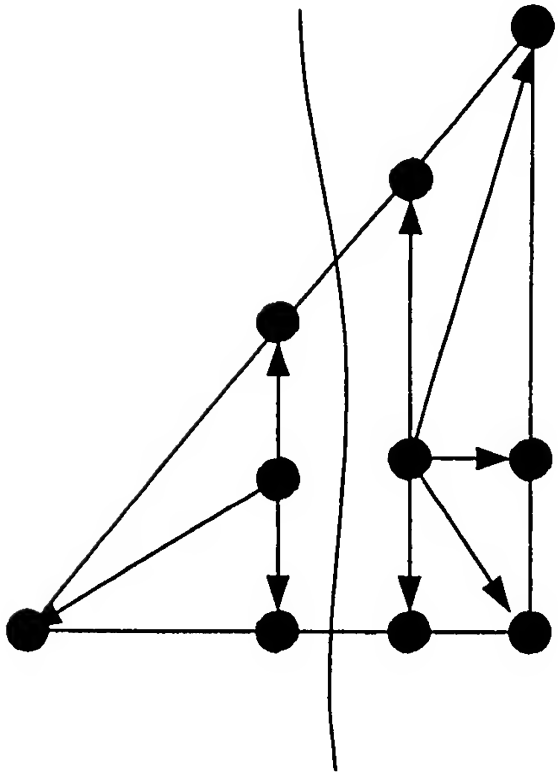


**Figure 31A**

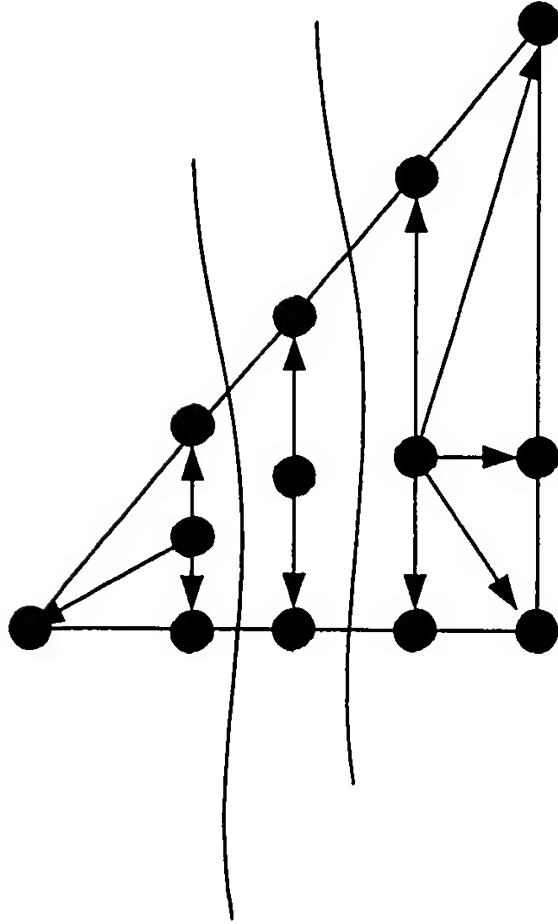
**Figure 31:**  $\frac{\text{Figure 31A}}{\text{Figure 31B}}$



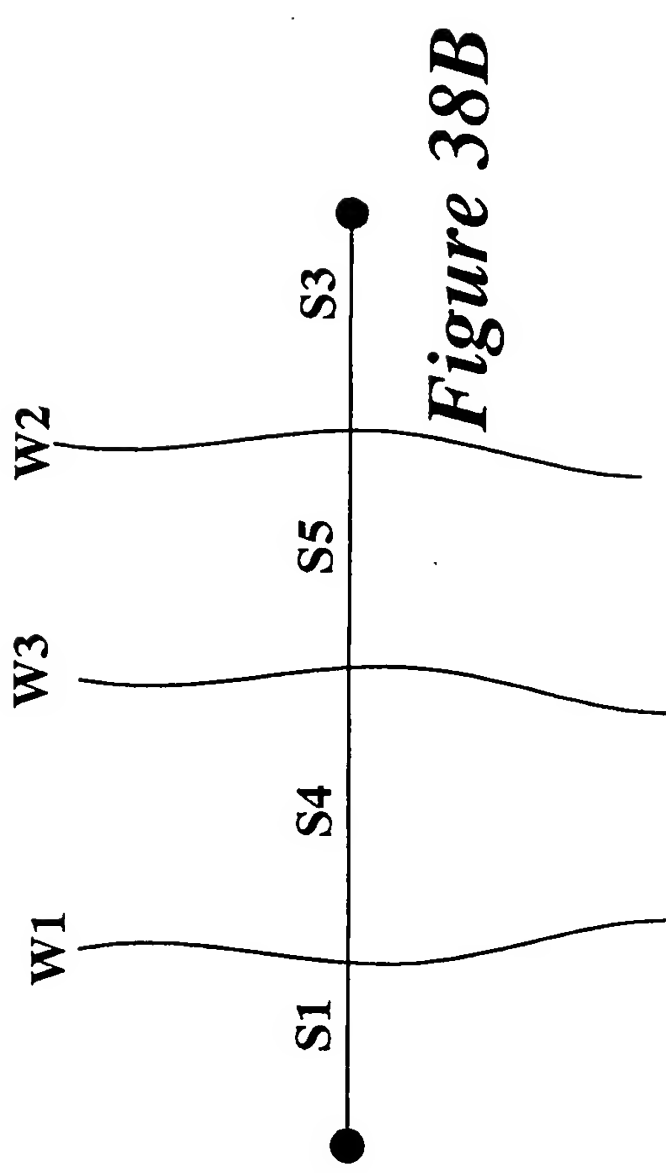
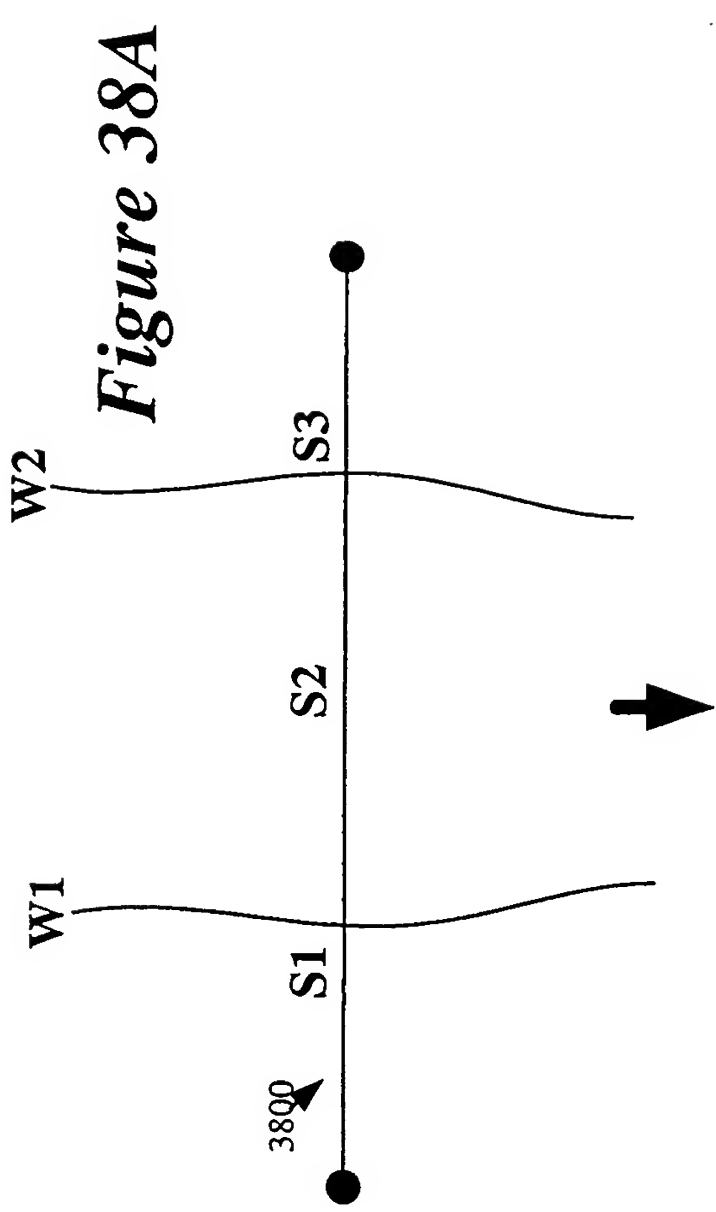
**Figure 31B**



*Figure 35*

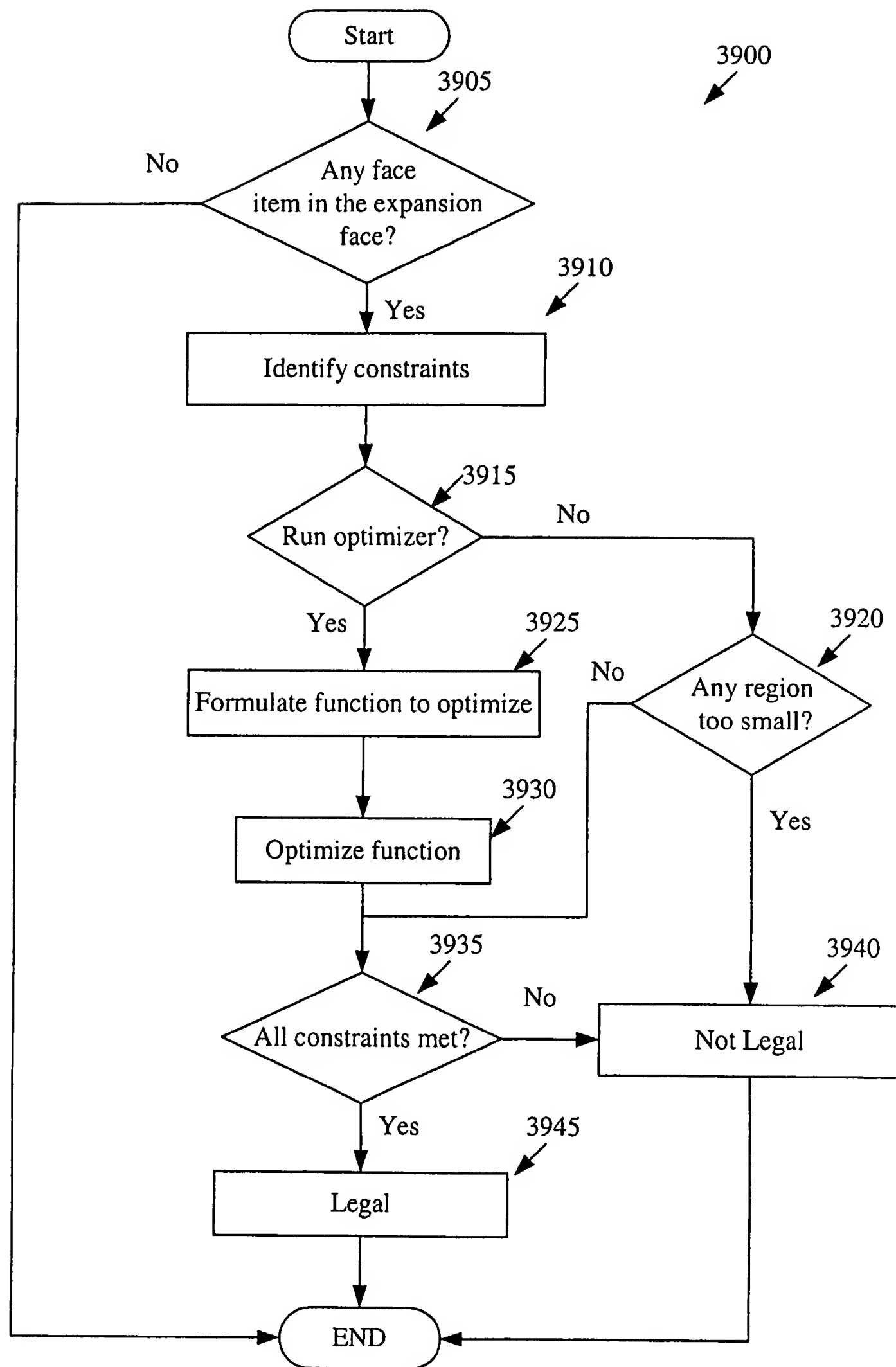


*Figure 36*



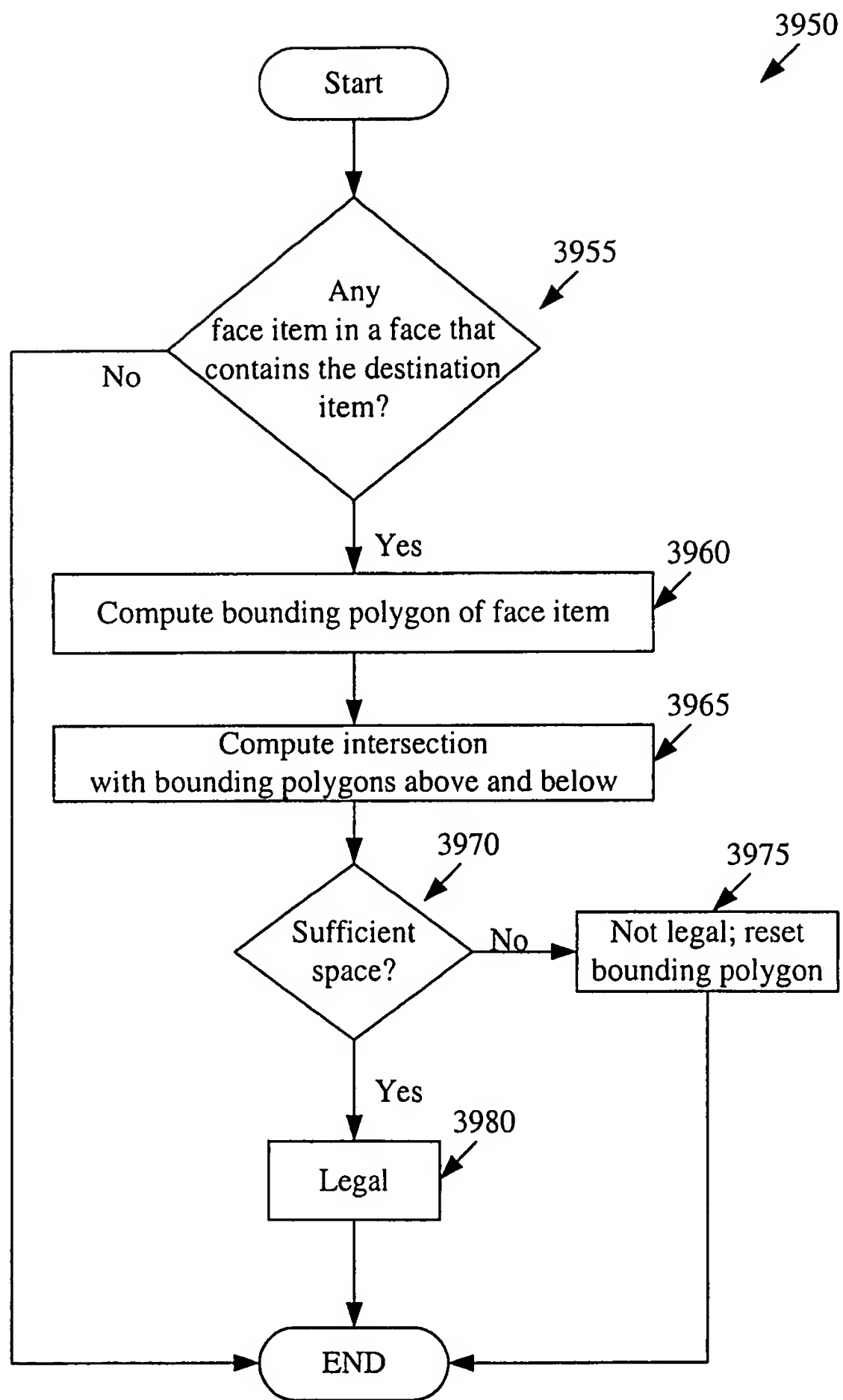
To: Node		Face Item	Edge Item
From:	Node		
	<ul style="list-style-type: none"> <li>Planarity</li> <li>Vias</li> </ul>	<ul style="list-style-type: none"> <li>Vias</li> </ul>	<ul style="list-style-type: none"> <li>Planarity</li> <li>Vias</li> <li>Edge</li> <li>Capacity</li> </ul>
	<ul style="list-style-type: none"> <li>Vias</li> </ul>	<ul style="list-style-type: none"> <li>Vias</li> </ul>	<ul style="list-style-type: none"> <li>Vias</li> <li>Edge</li> <li>Capacity</li> </ul>
	<ul style="list-style-type: none"> <li>Planarity</li> <li>Vias</li> </ul>	<ul style="list-style-type: none"> <li>Vias</li> </ul>	<ul style="list-style-type: none"> <li>Planarity</li> <li>Vias</li> <li>Edge</li> <li>Capacity</li> </ul>

Figure 37

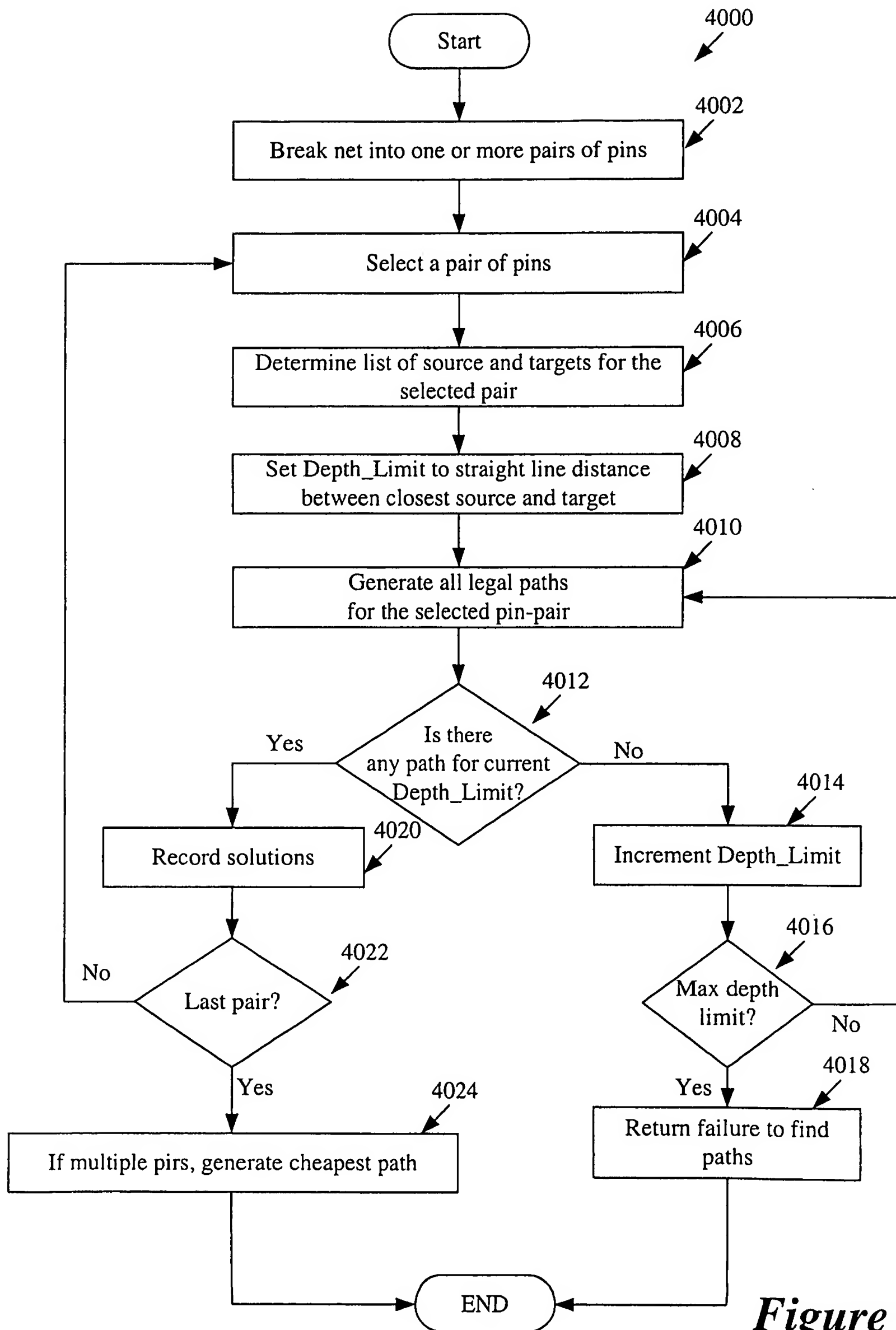


**Figure 39A**

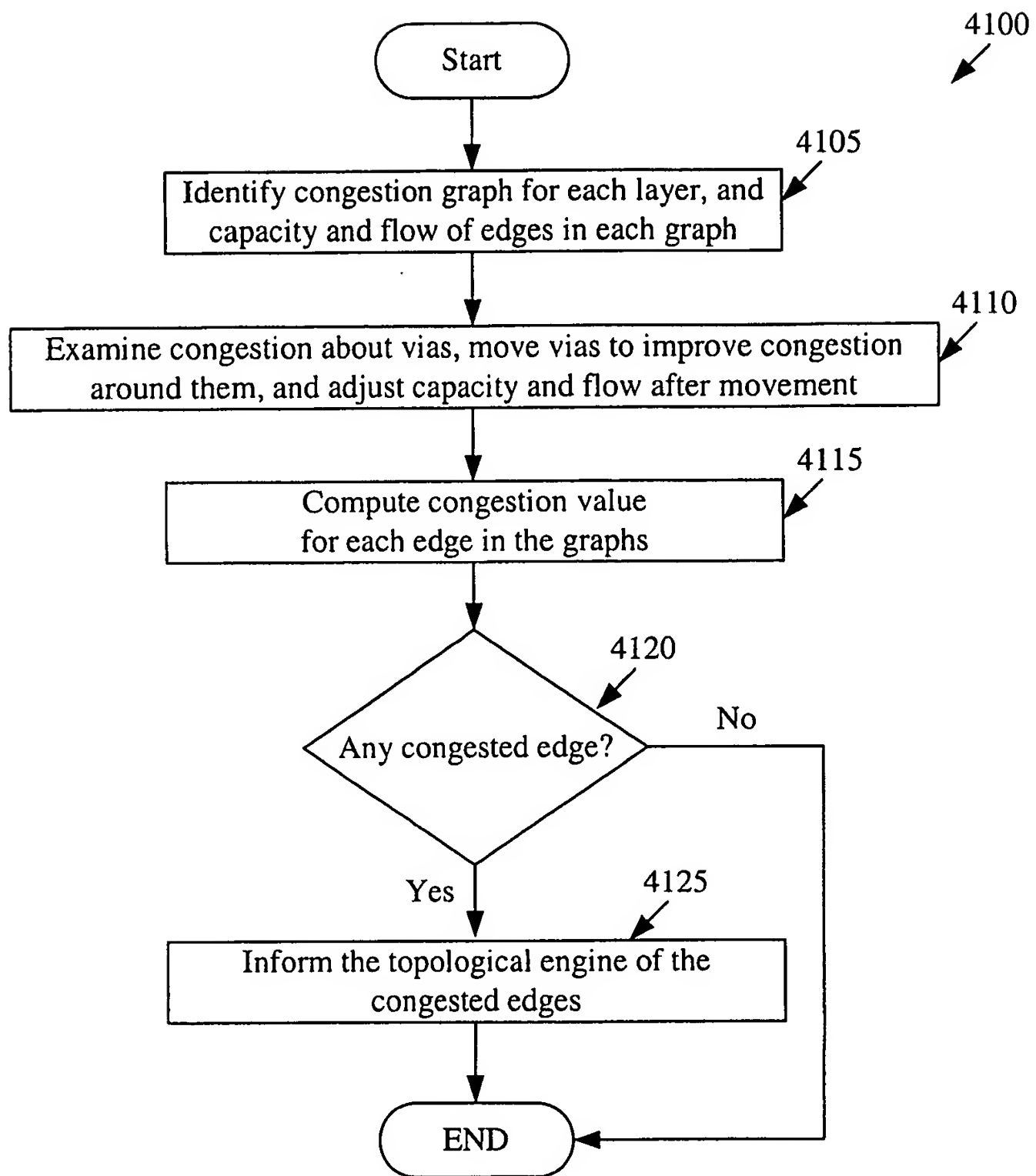




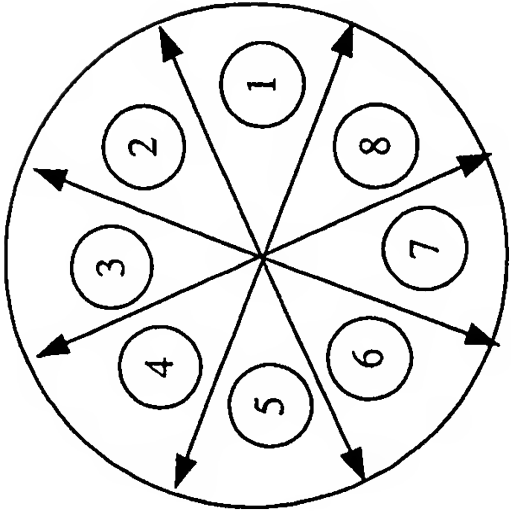
**Figure 39B**



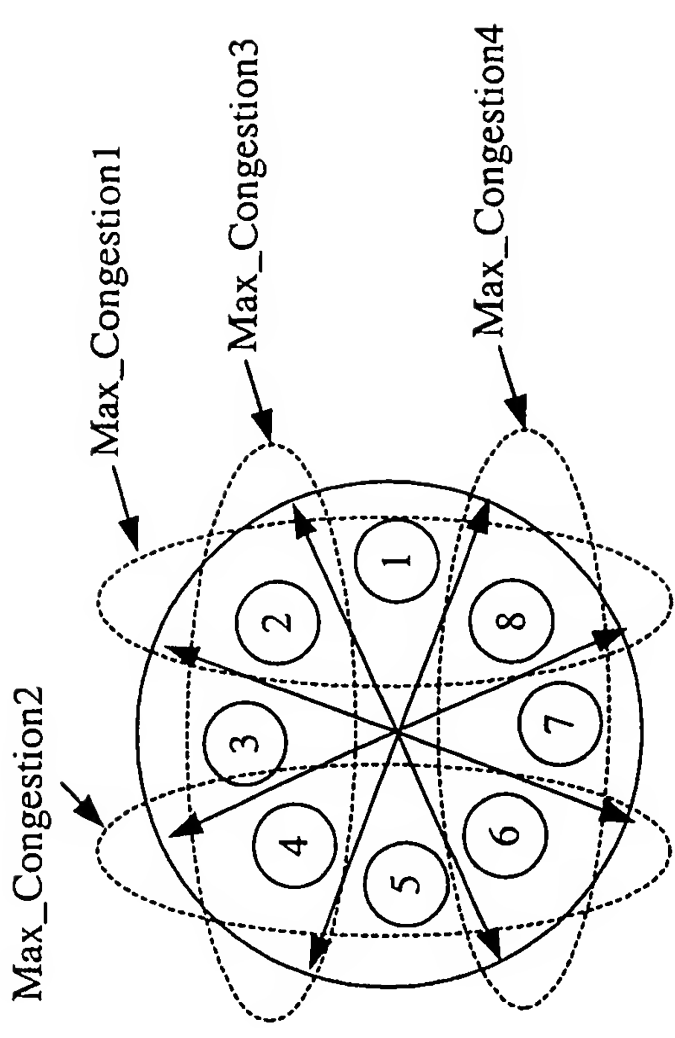
**Figure 40**



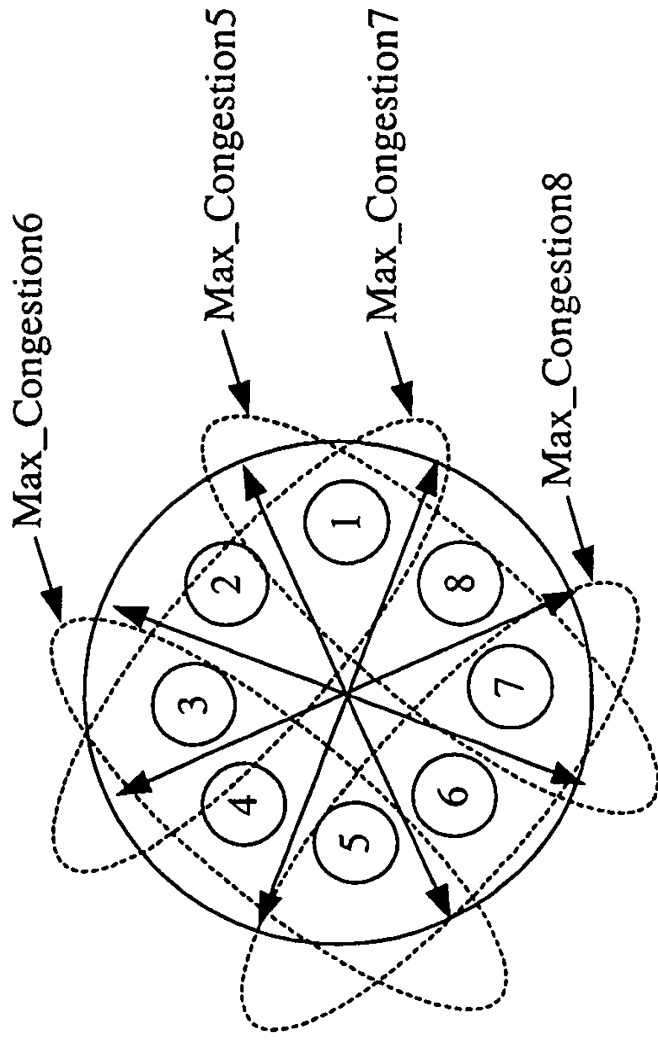
**Figure 41**



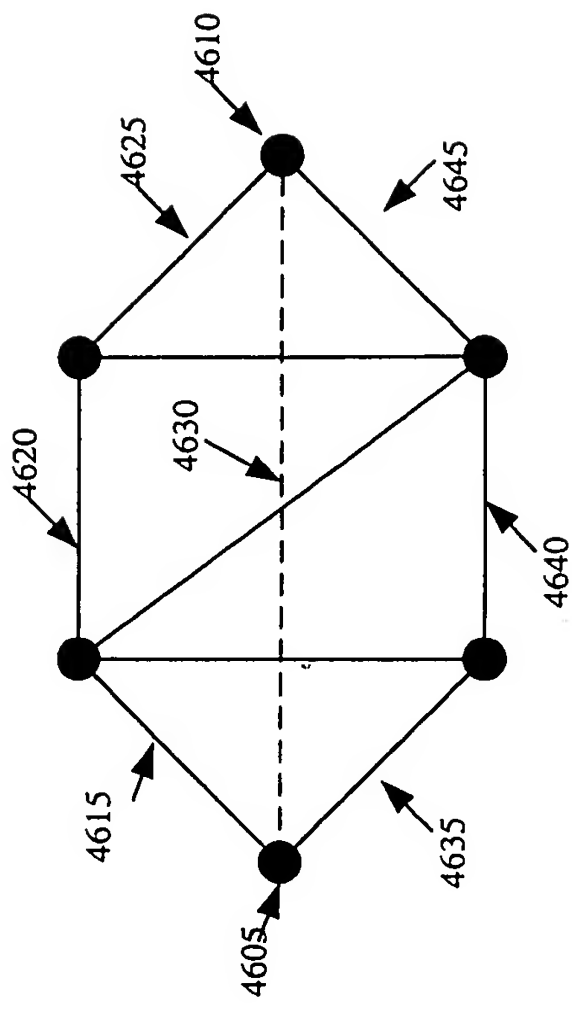
*Figure 42*



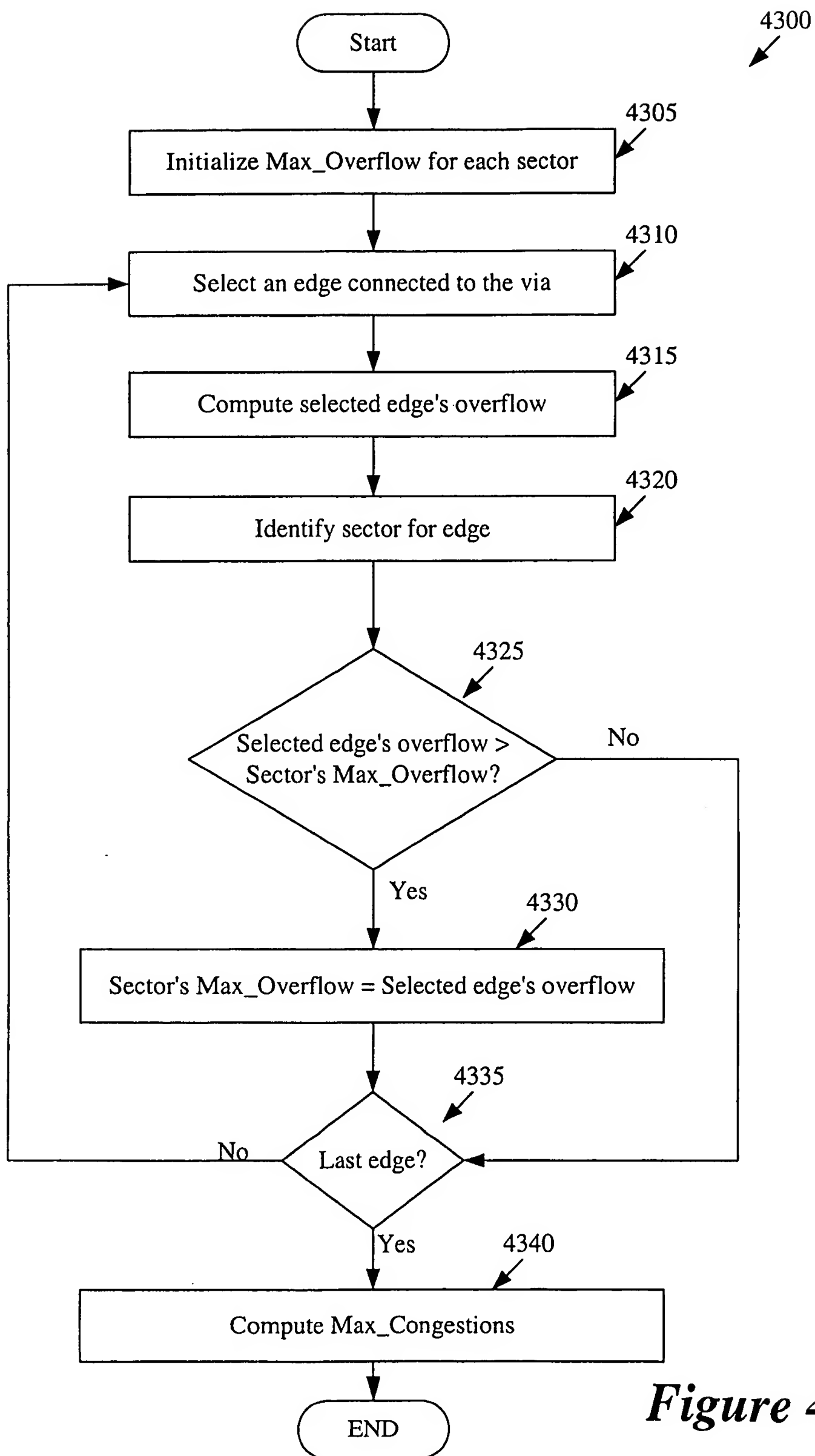
*Figure 44*



*Figure 45*



*Figure 46*



*Figure 43*

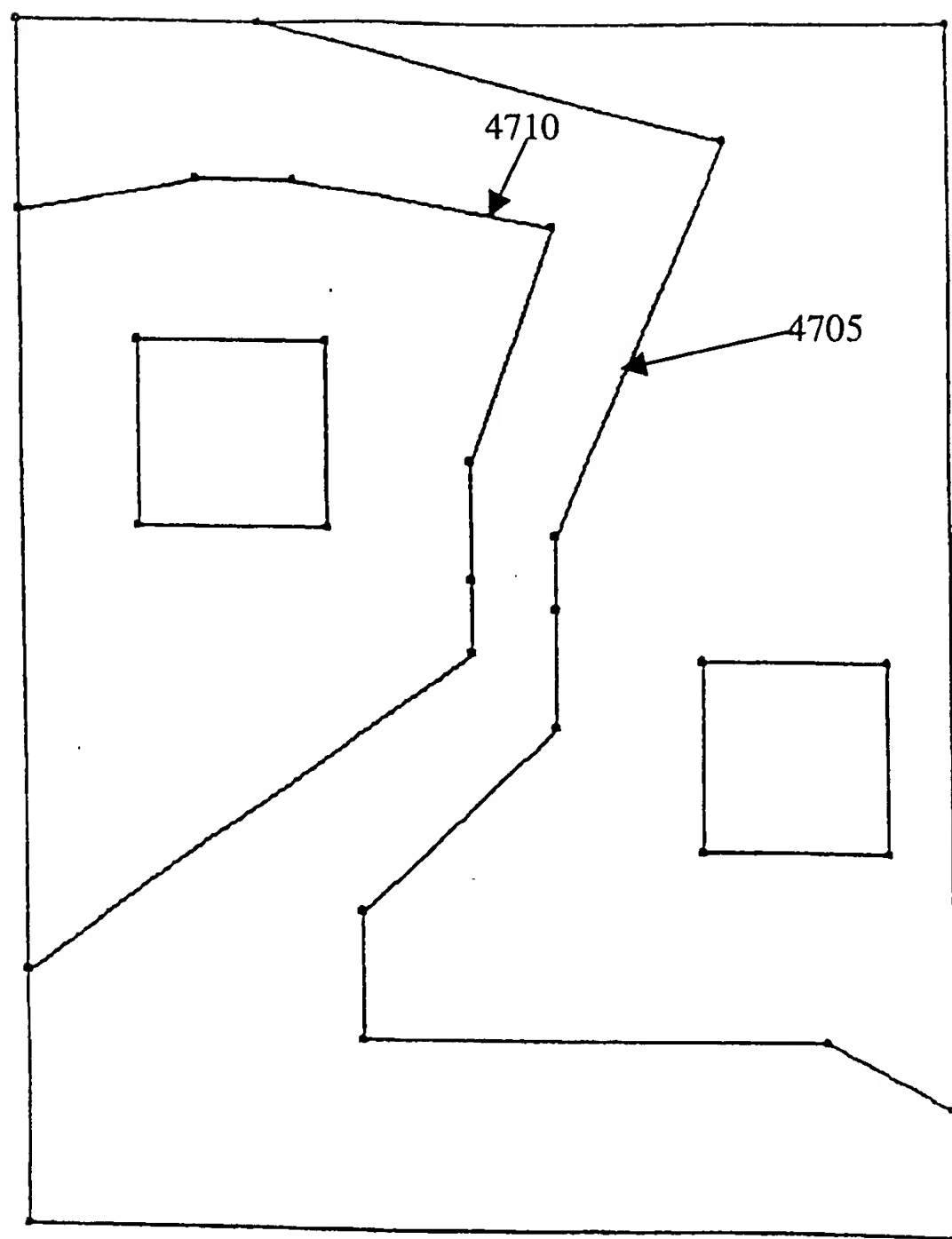


Figure 47

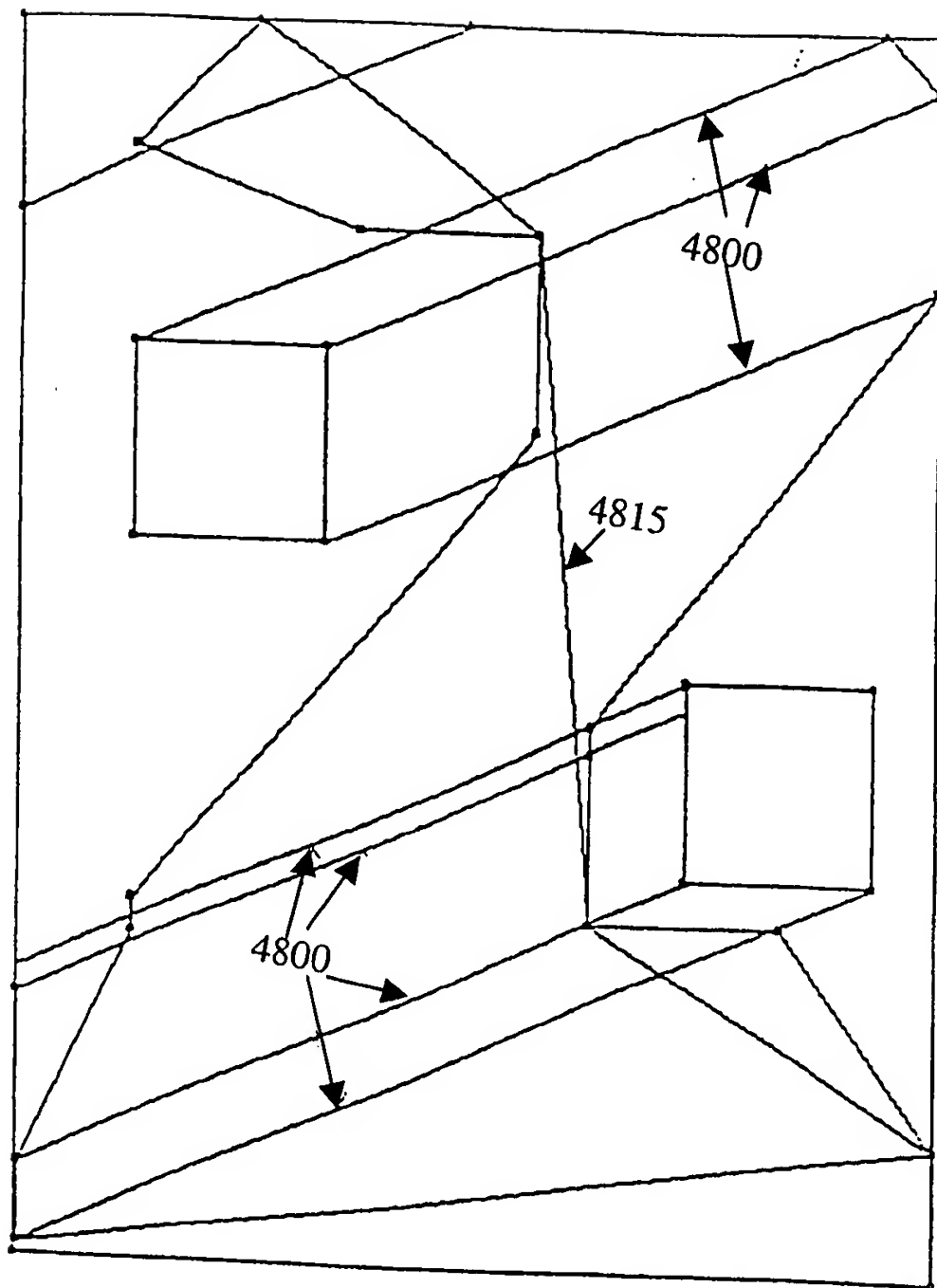


Figure 48A

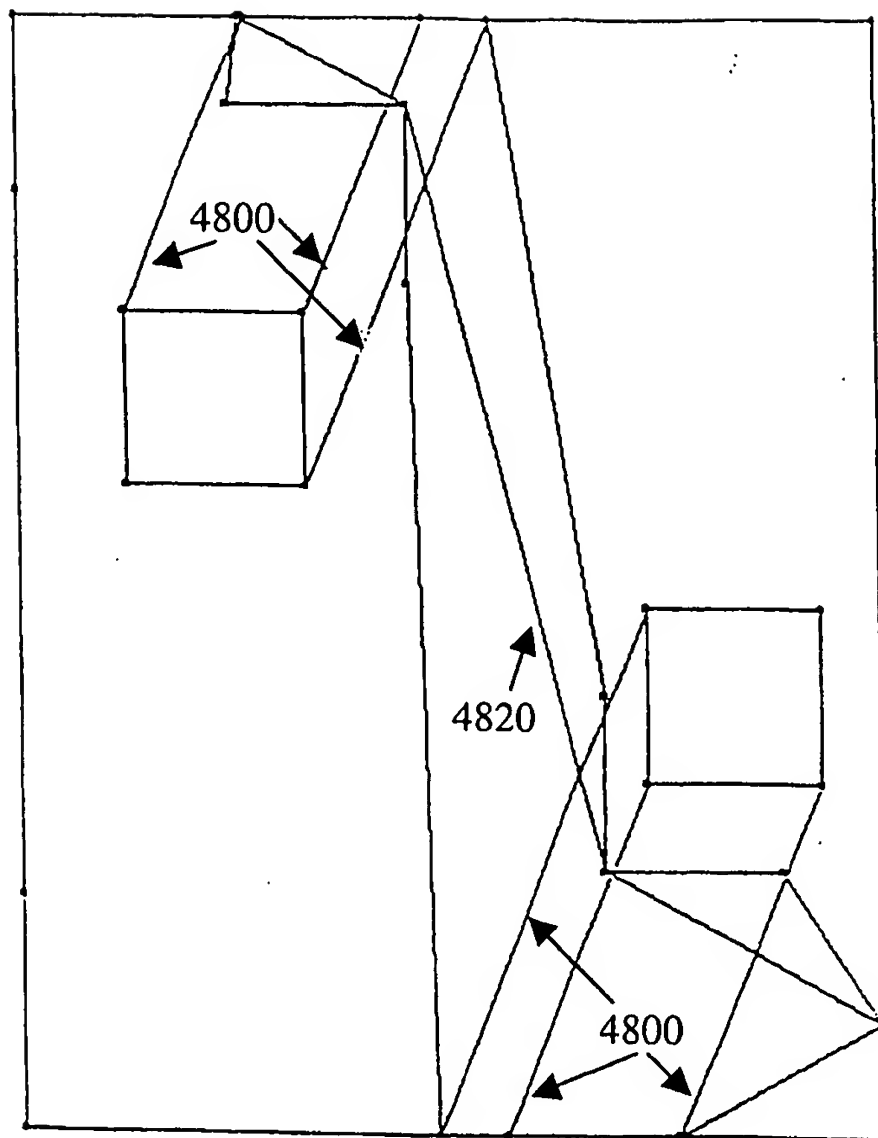


Figure 48B



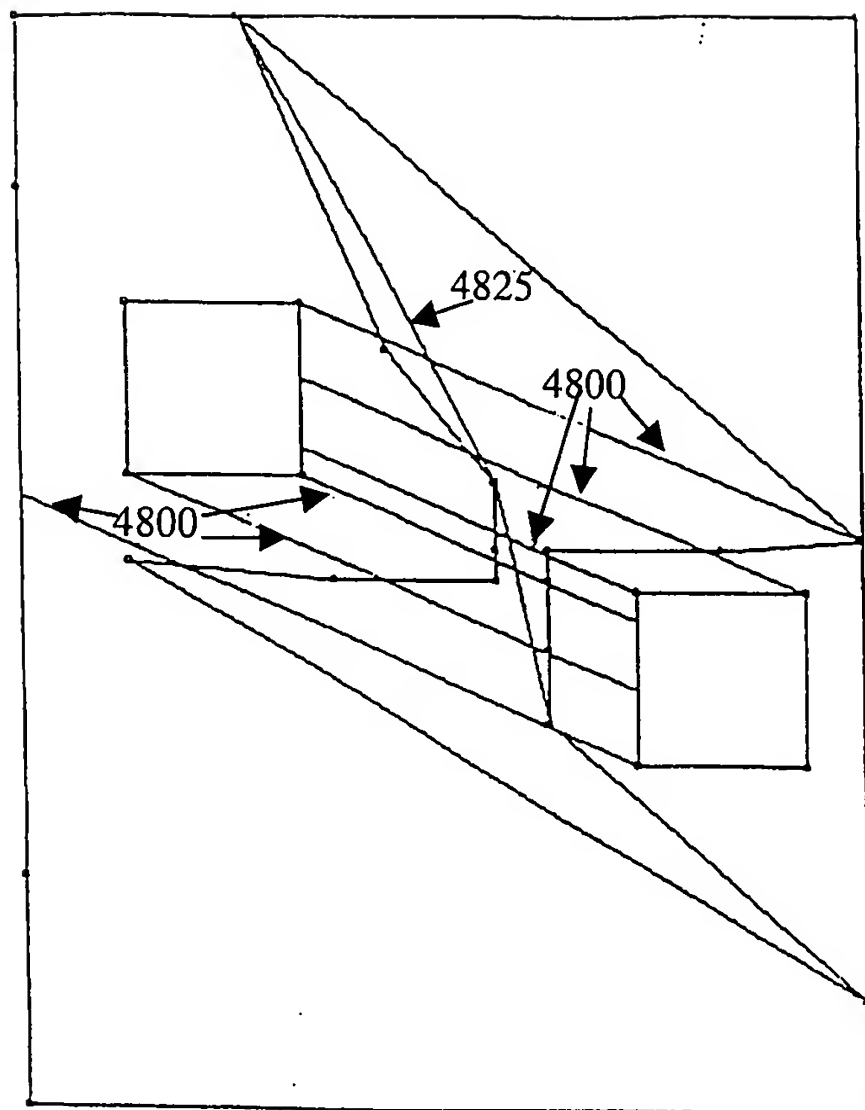


Figure 48C

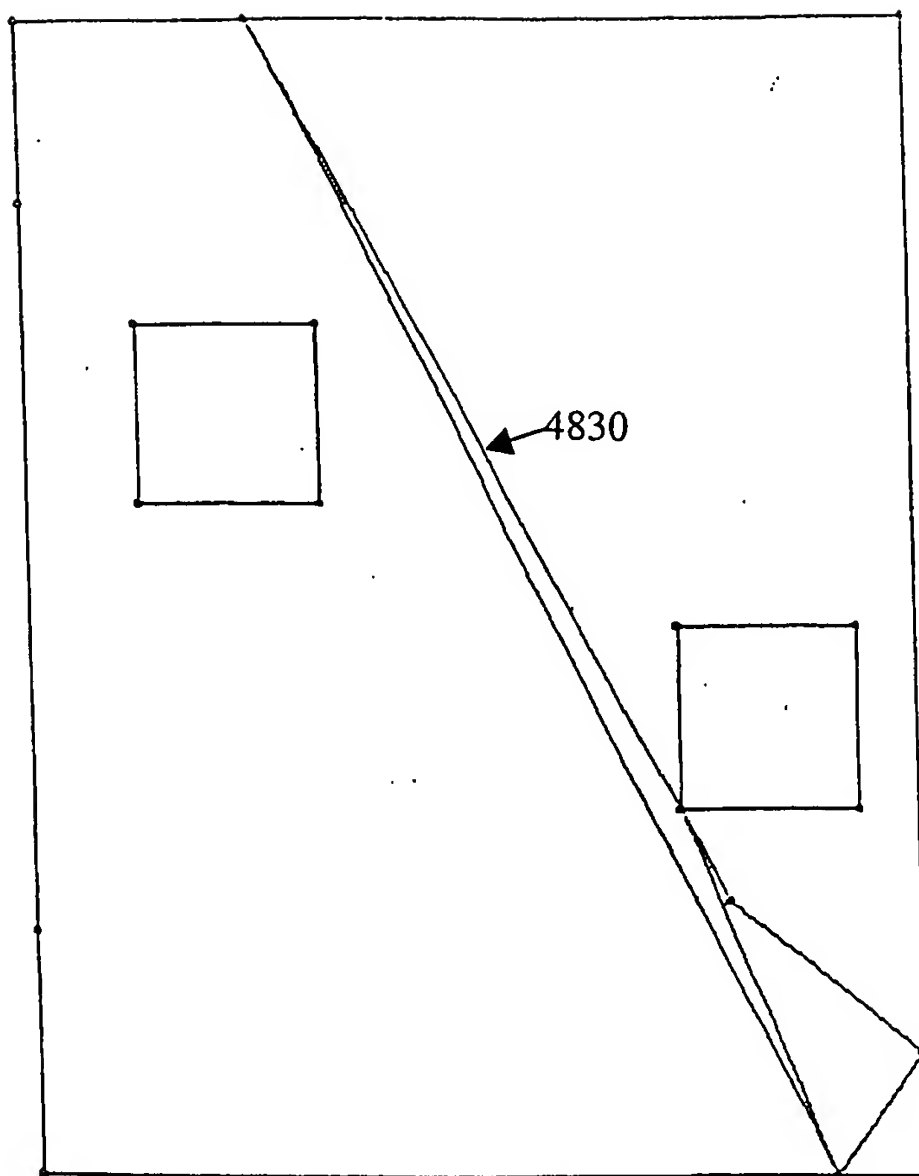
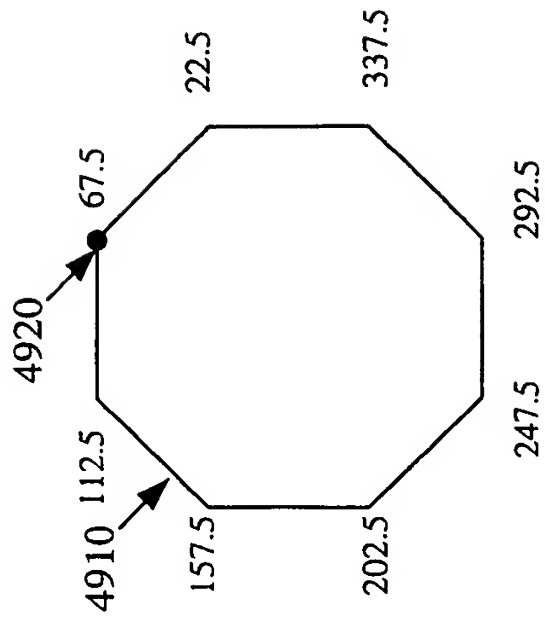


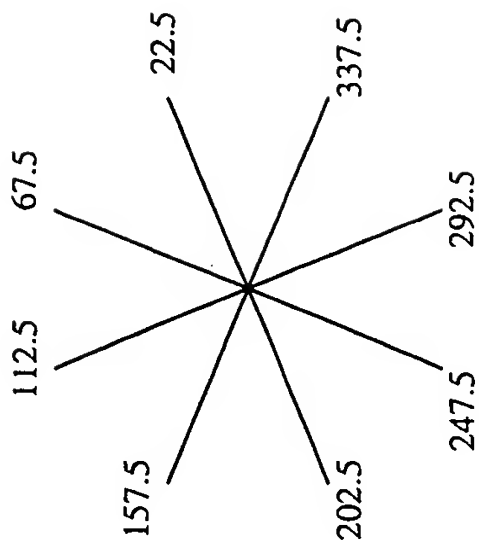
Figure 48D



*Figure 49A*



*Figure 49B*



*Figure 49C*

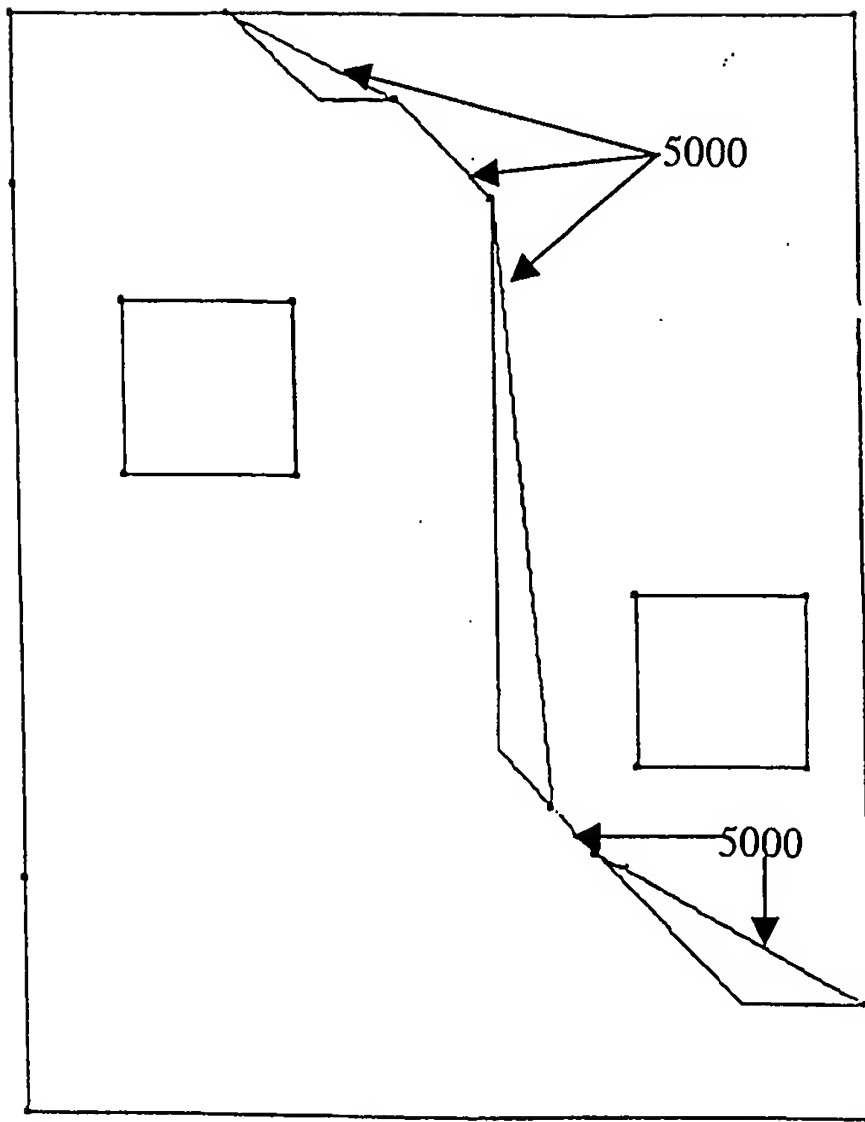
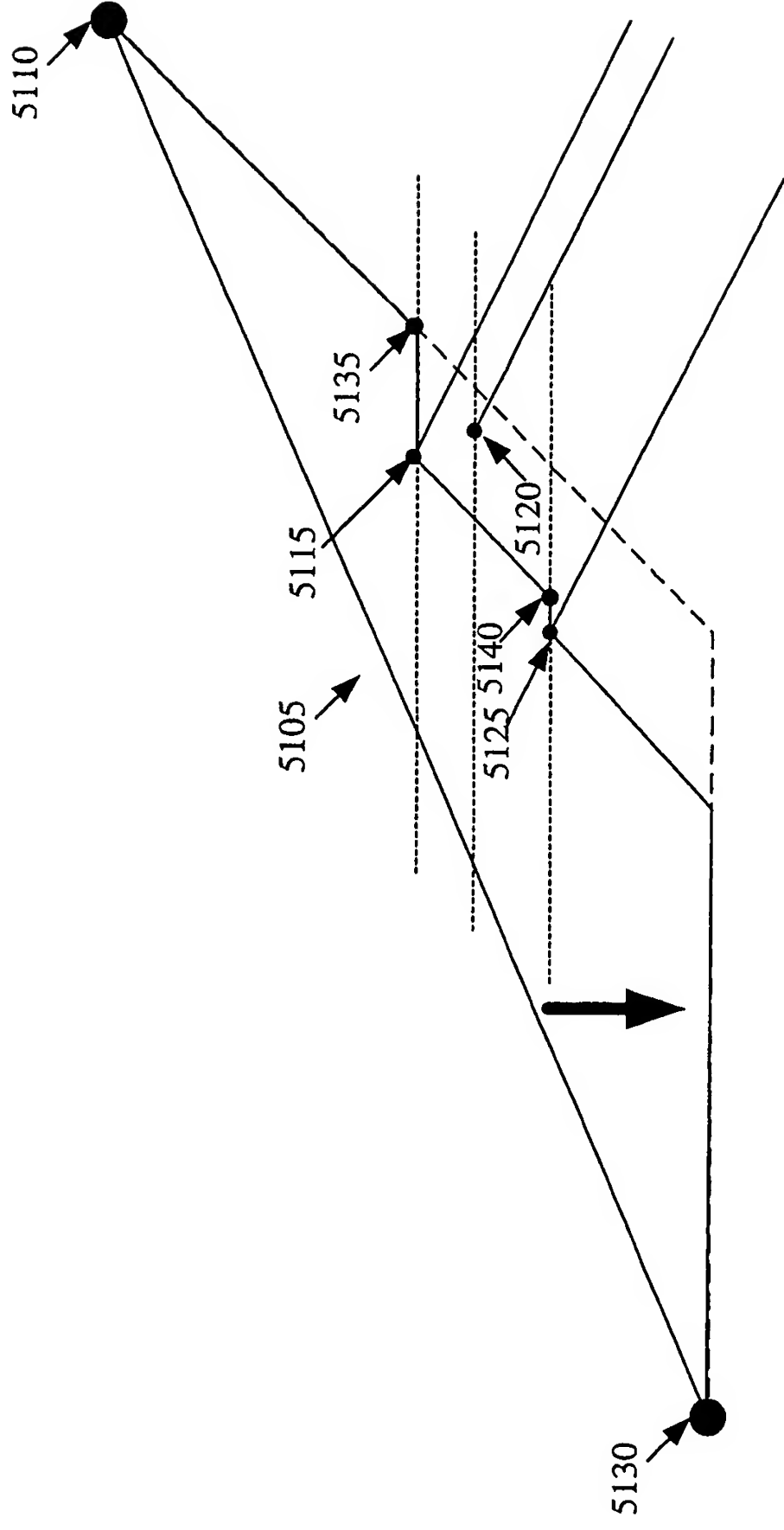


Figure 50



**Figure 51**

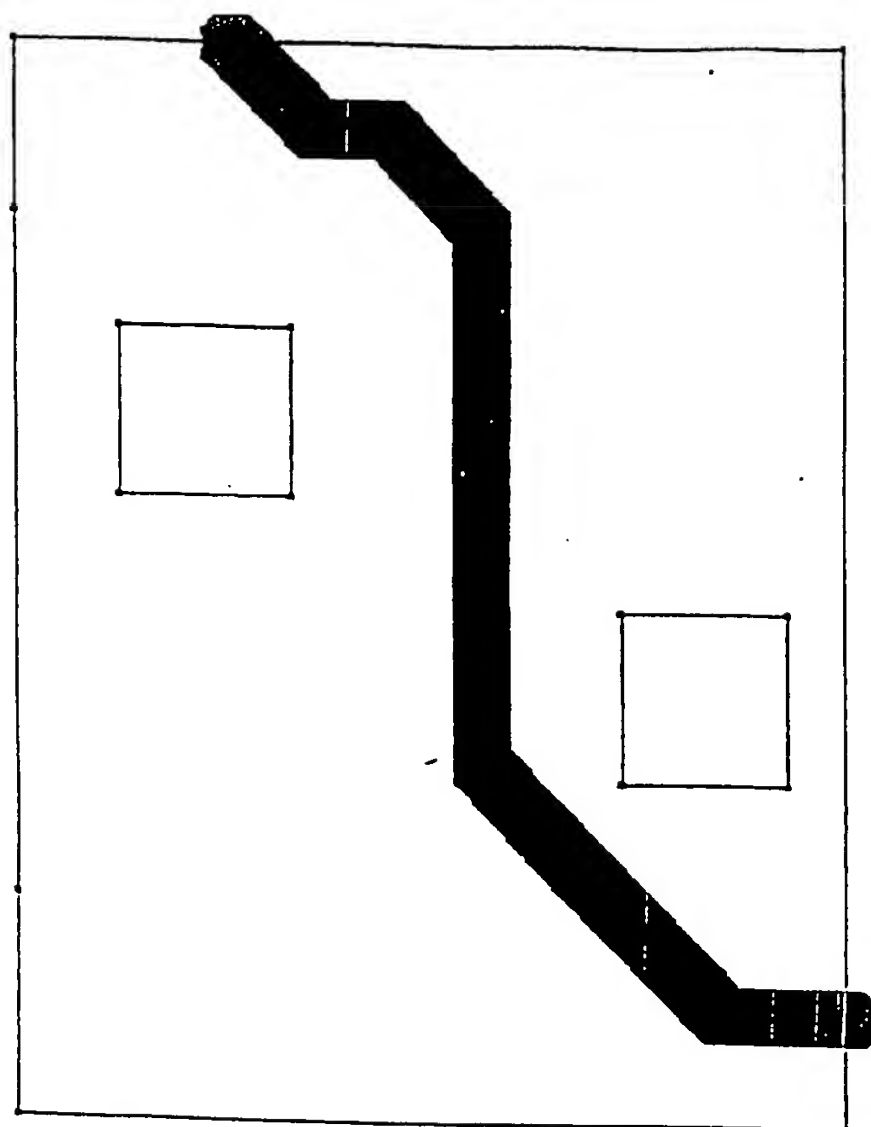
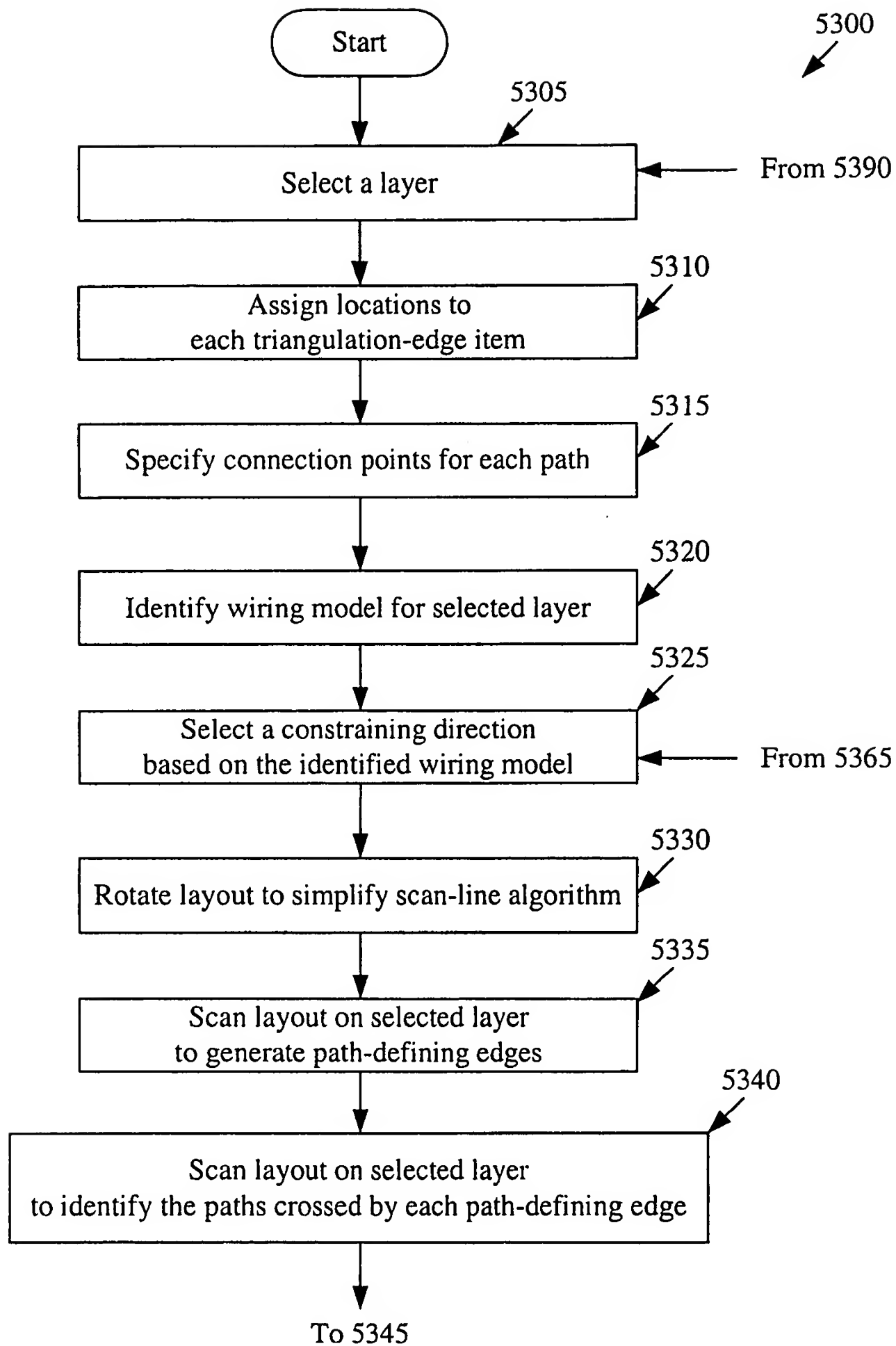
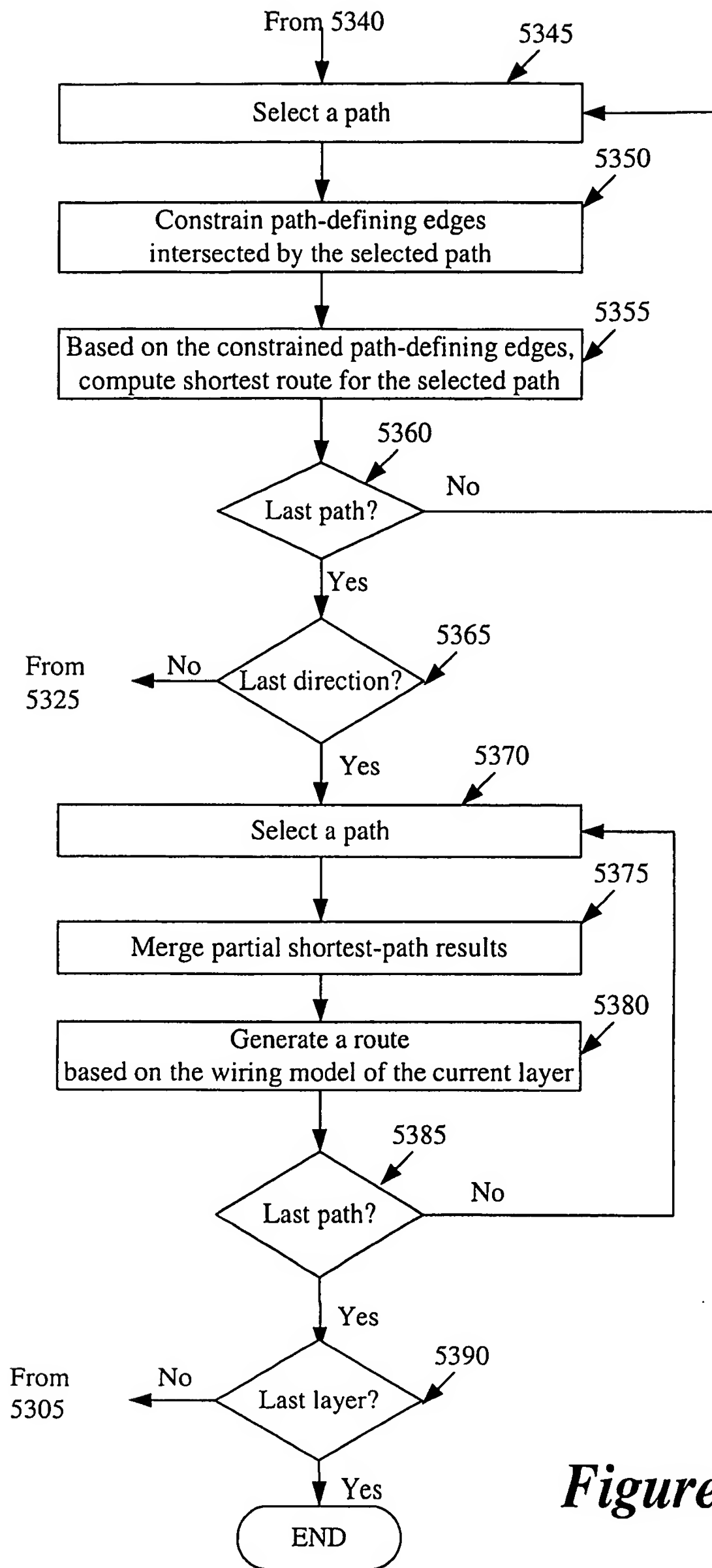


Figure 52



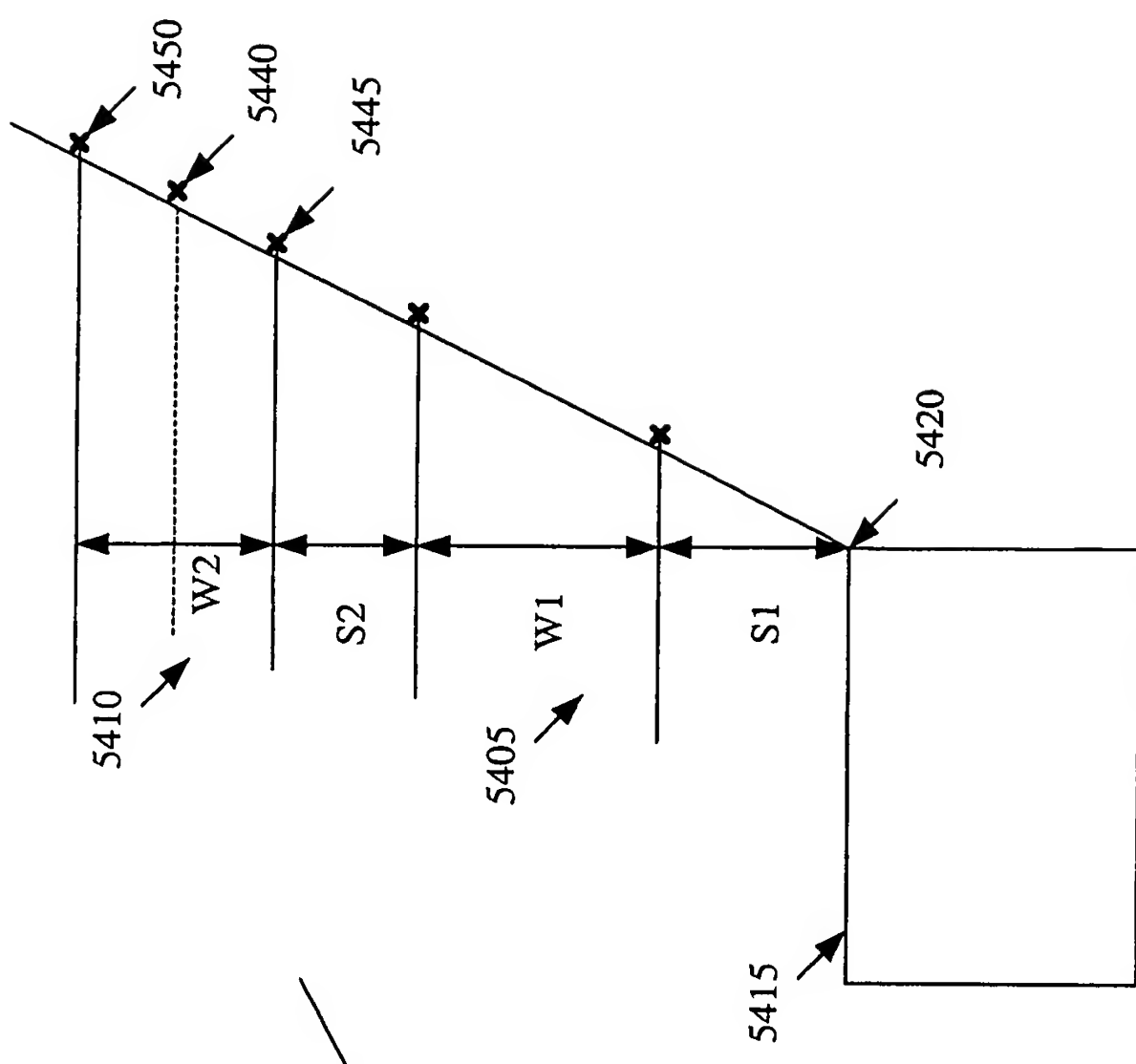
**Figure 53A**

**Figure 53:**  $\frac{\text{Figure 53A}}{\text{Figure 53B}}$

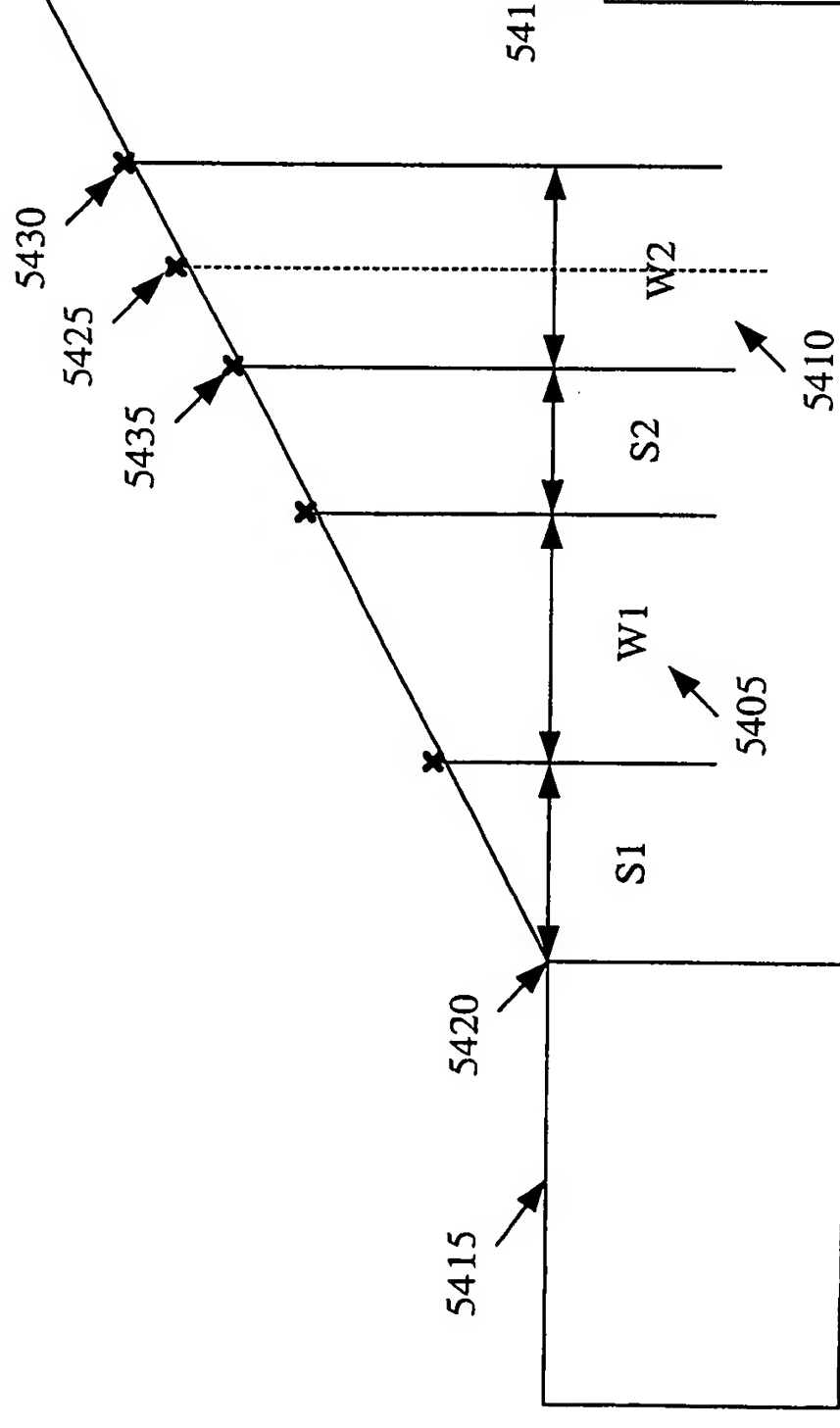


**Figure 53B**

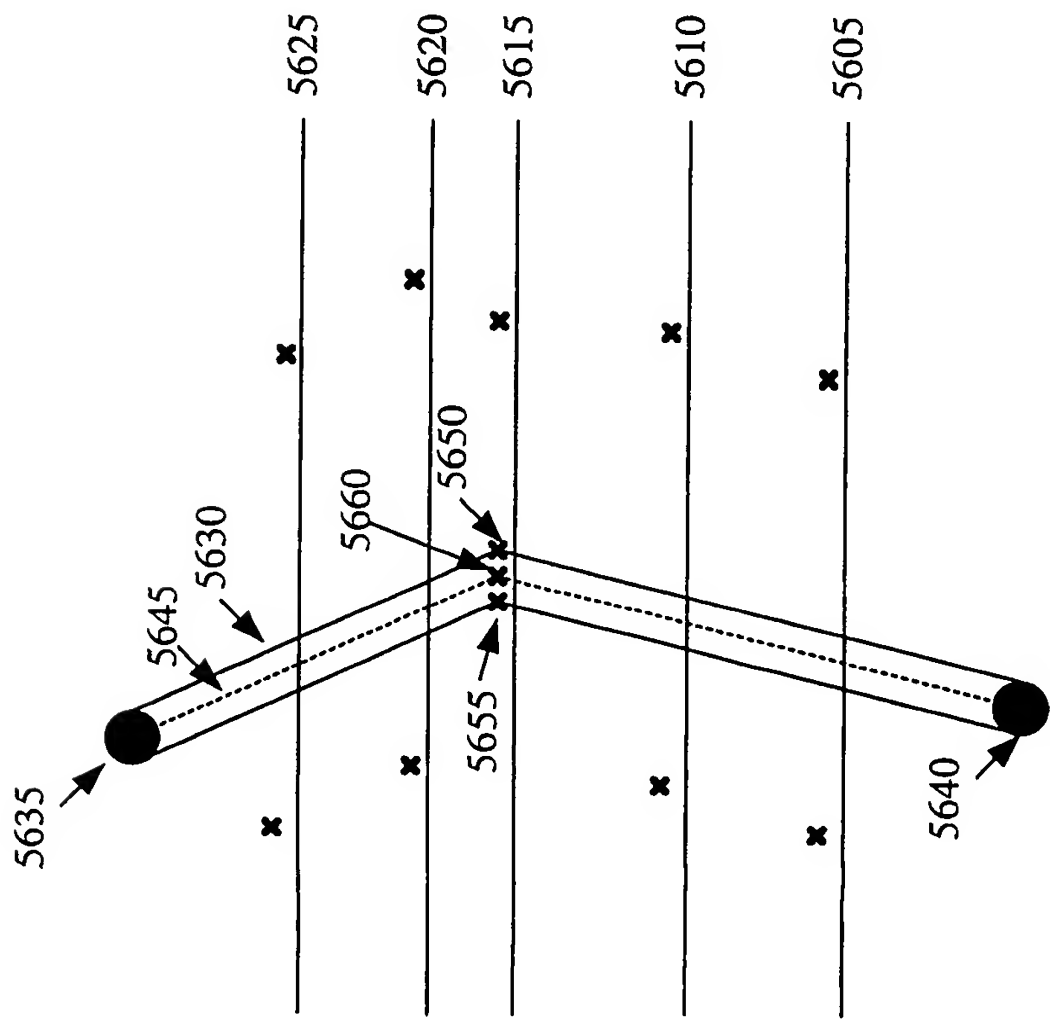




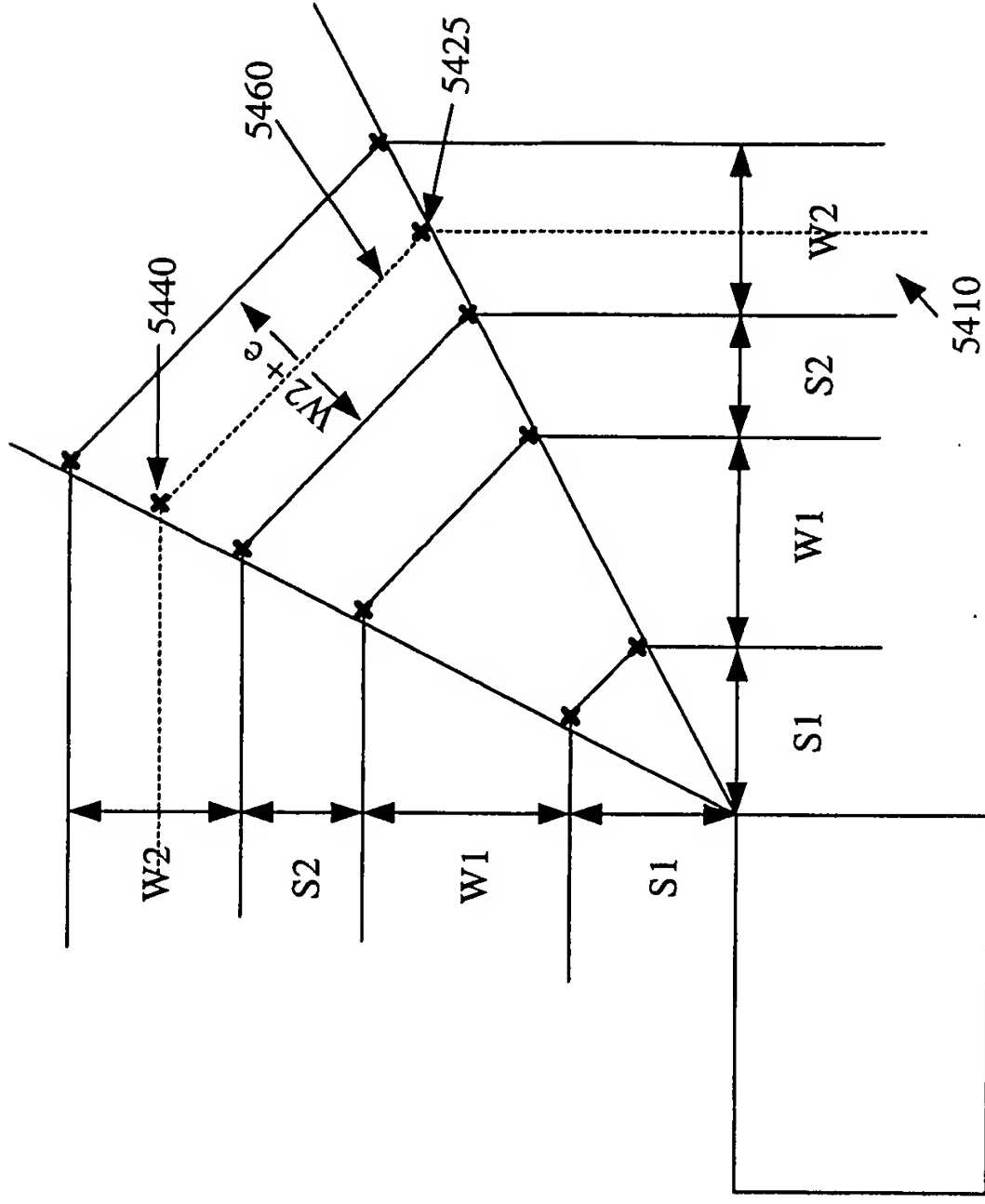
**Figure 54**



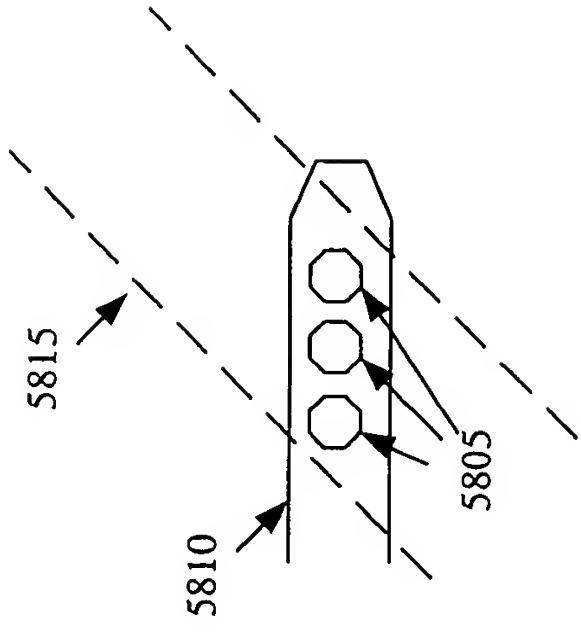
**Figure 55**



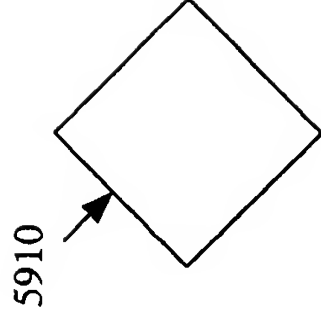
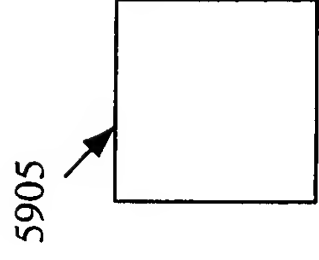
**Figure 56**



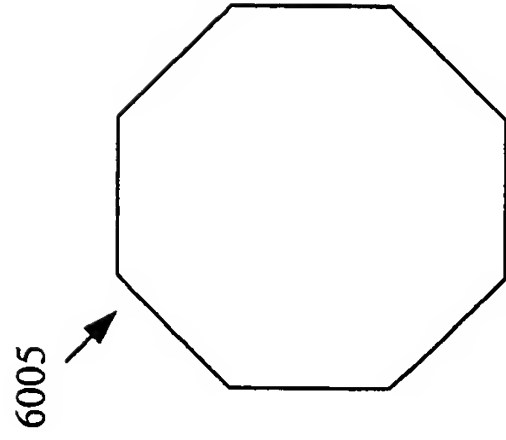
**Figure 57**



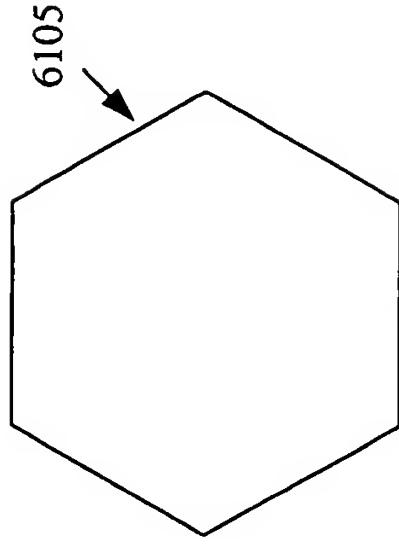
**Figure 58**



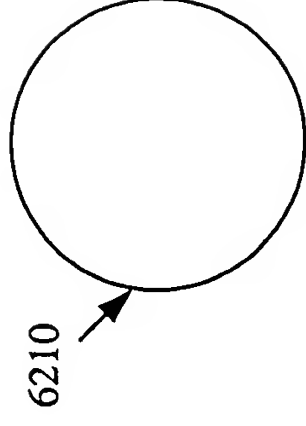
**Figure 59**



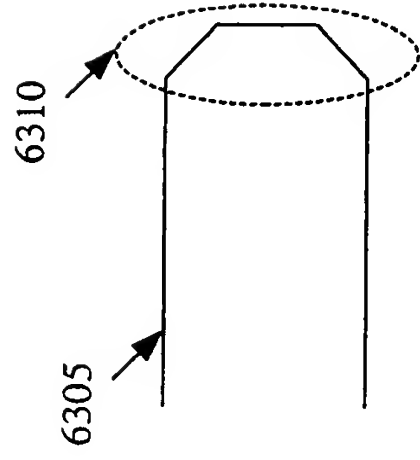
**Figure 60**



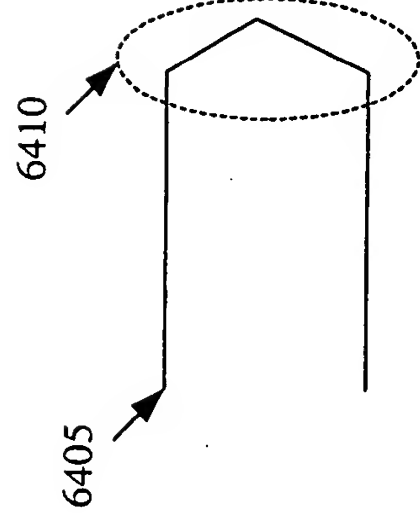
**Figure 61**



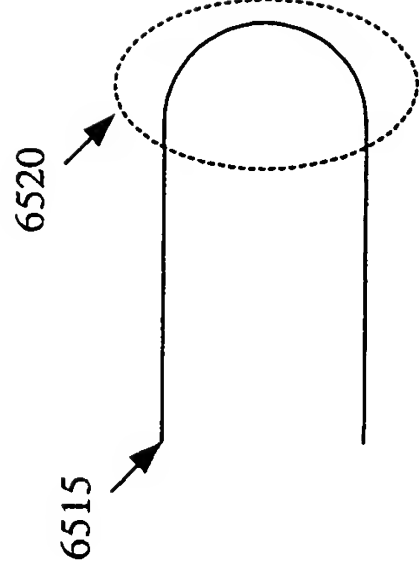
**Figure 62**



*Figure 63*

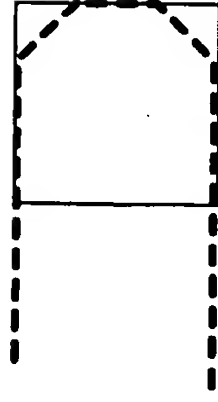


*Figure 64*

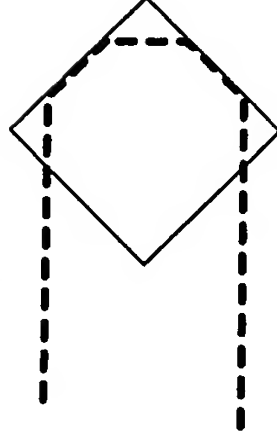


*Figure 65*

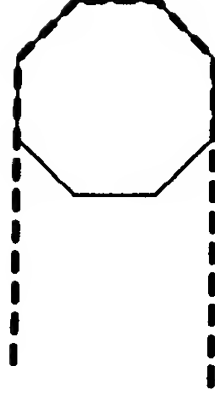
(1)



(2)

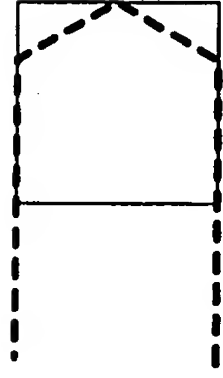


(3)

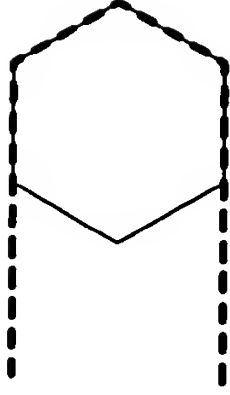


*Figure 66*

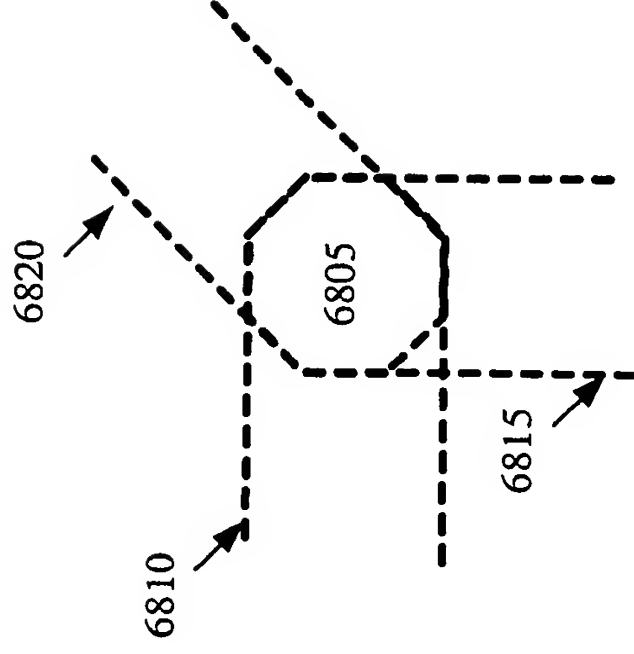
(1)



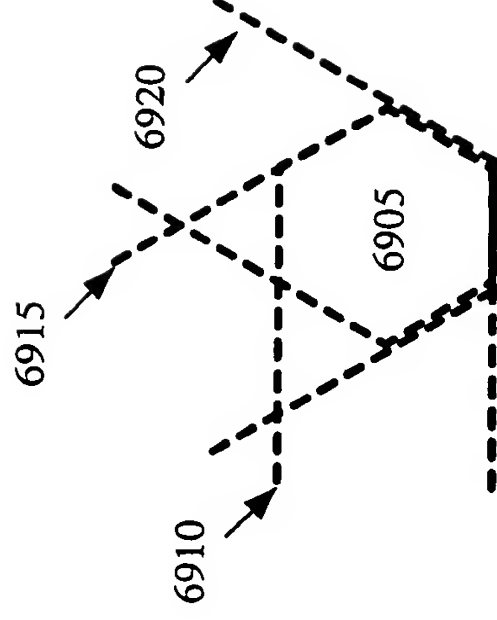
(2)



*Figure 67*



*Figure 68*



*Figure 69*

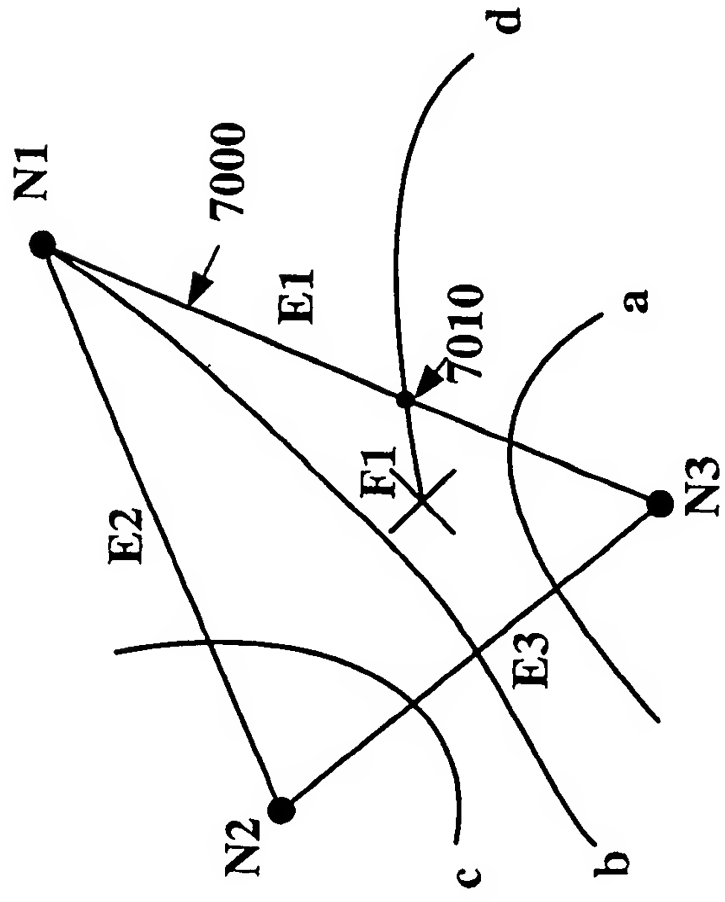


Figure 70

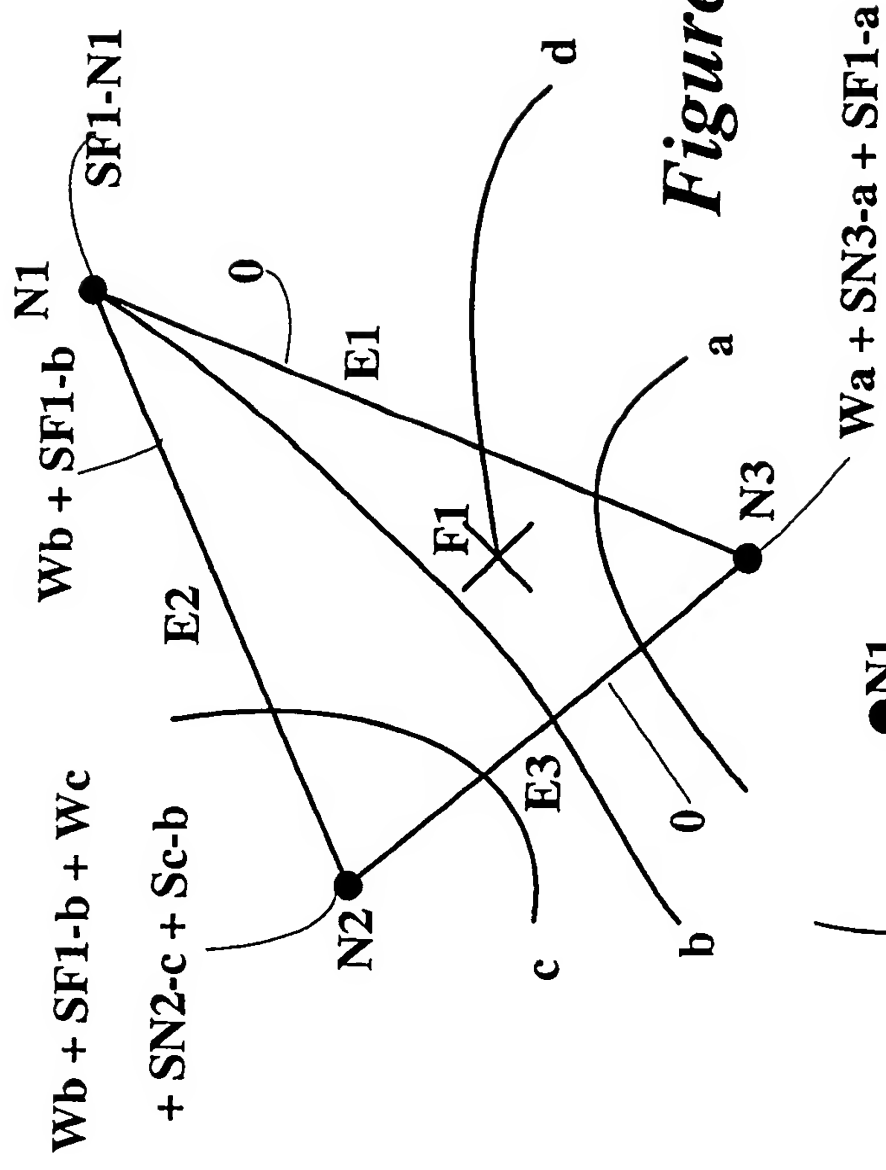


Figure 71

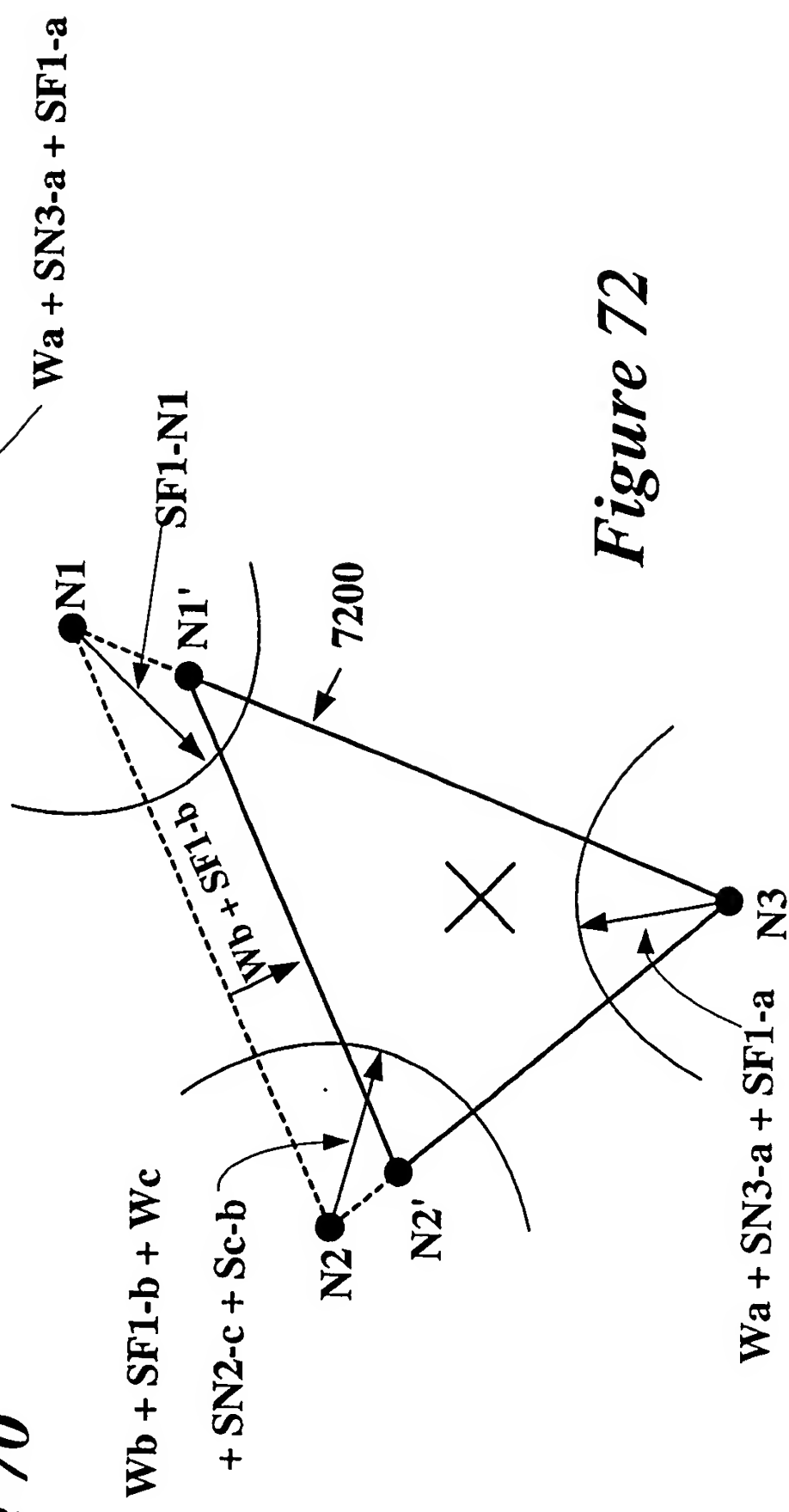


Figure 72

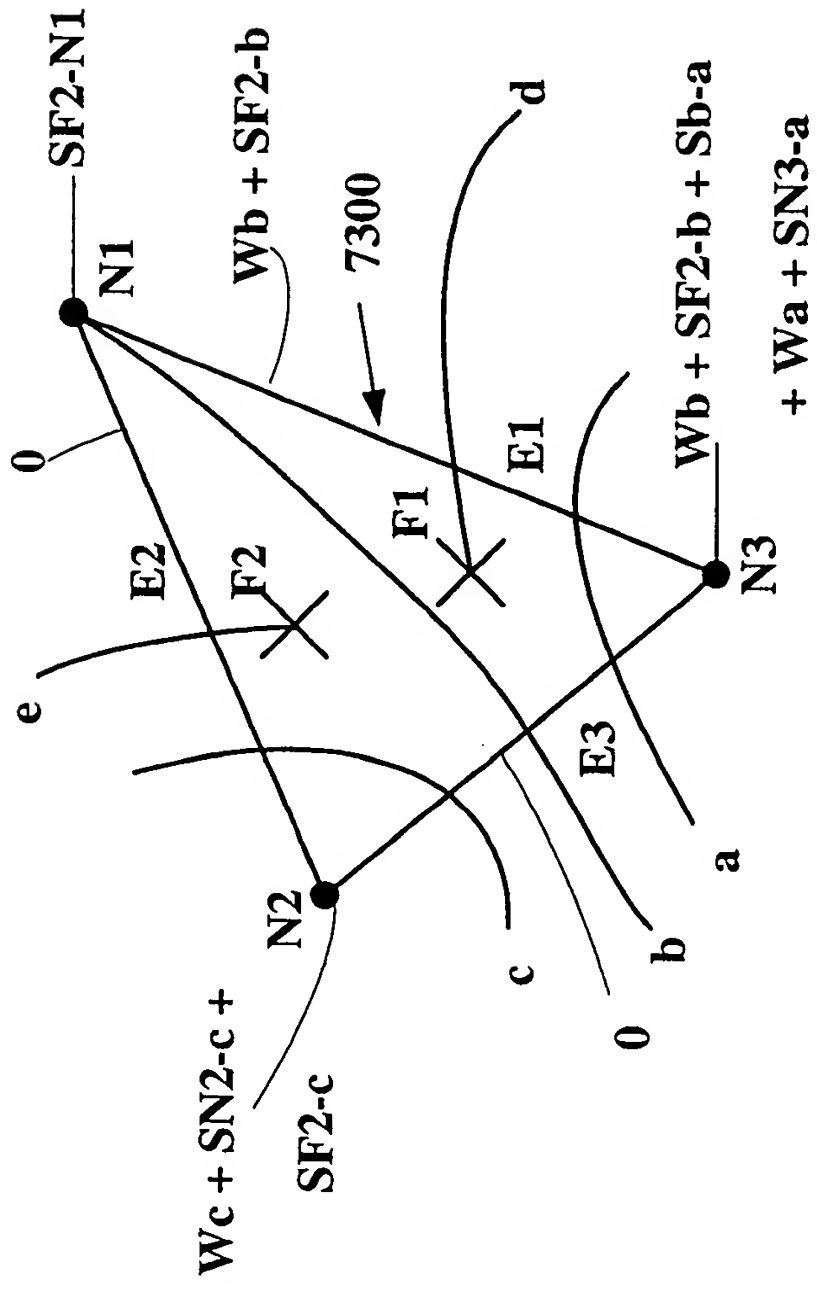


Figure 73

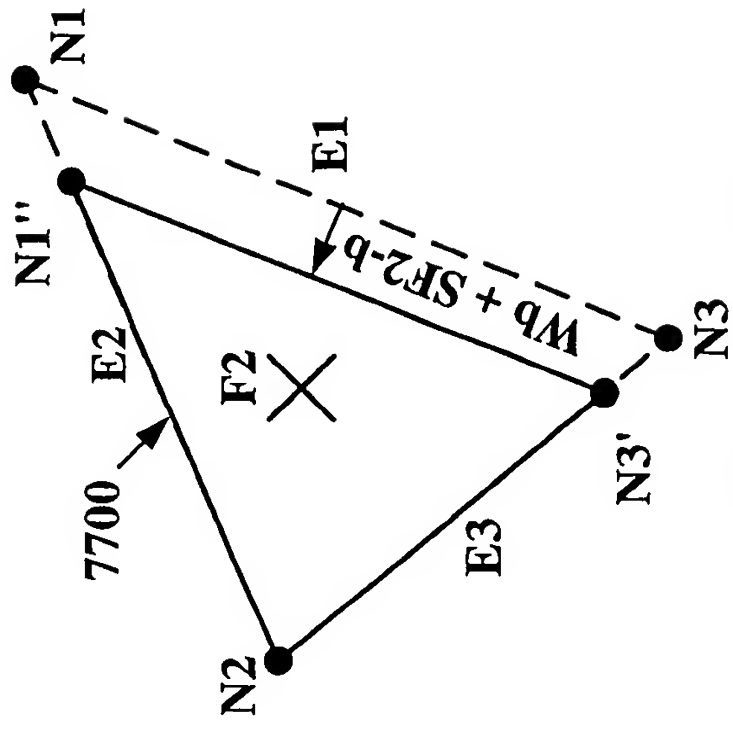


Figure 77

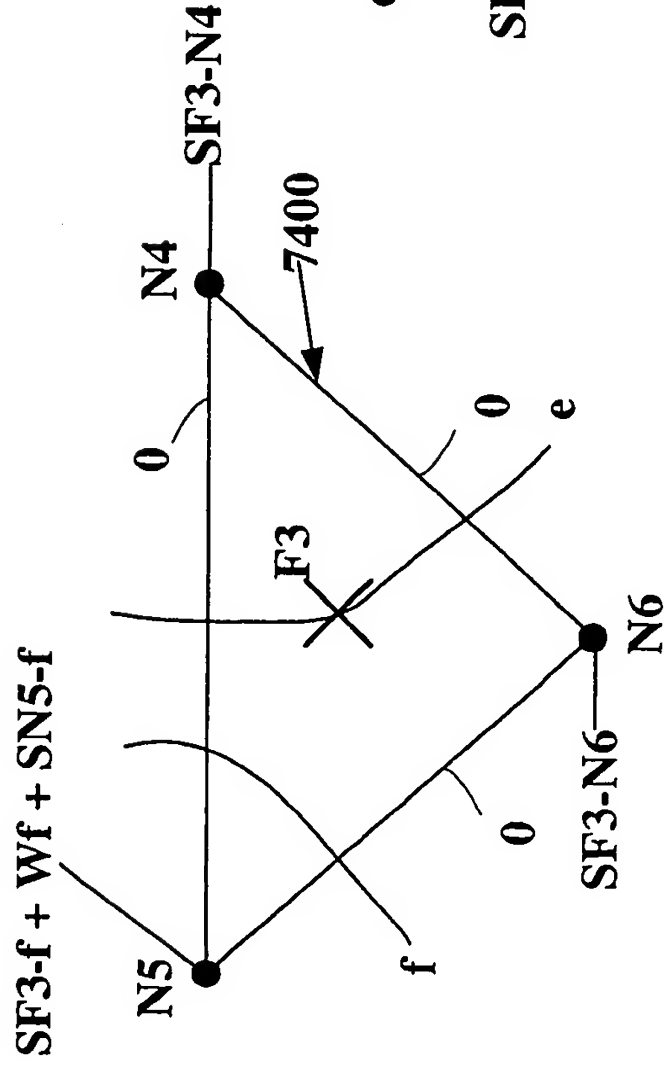


Figure 74

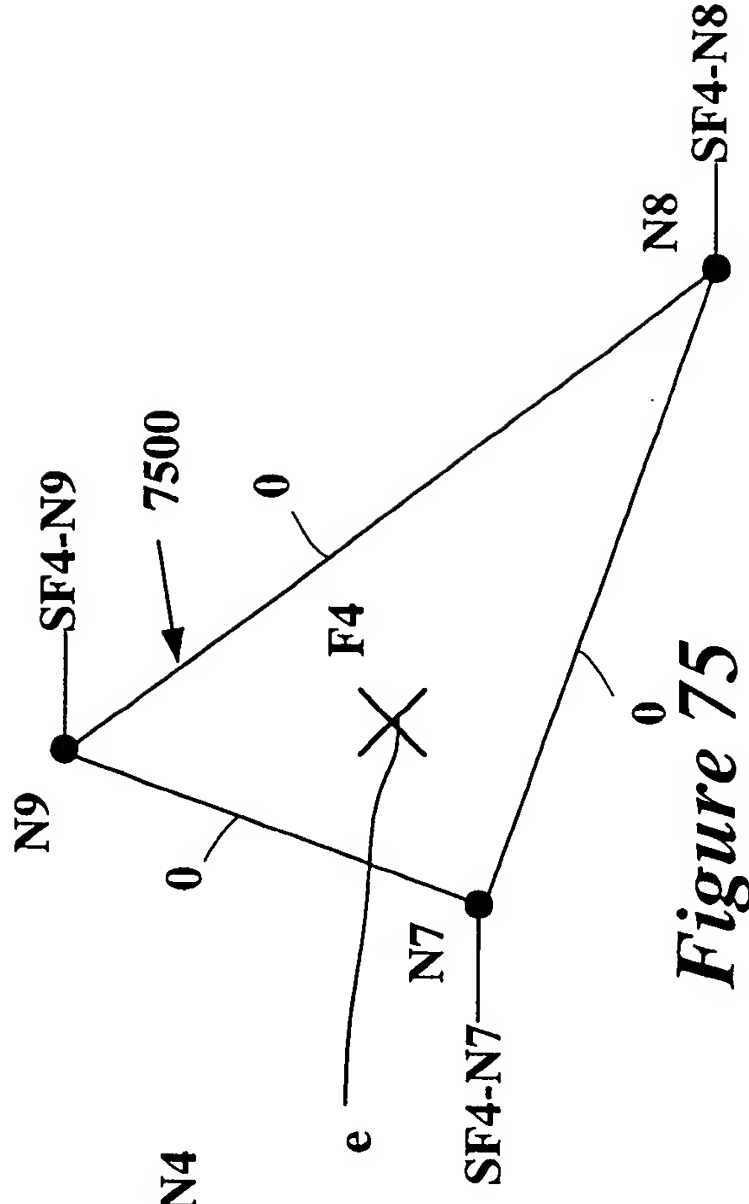
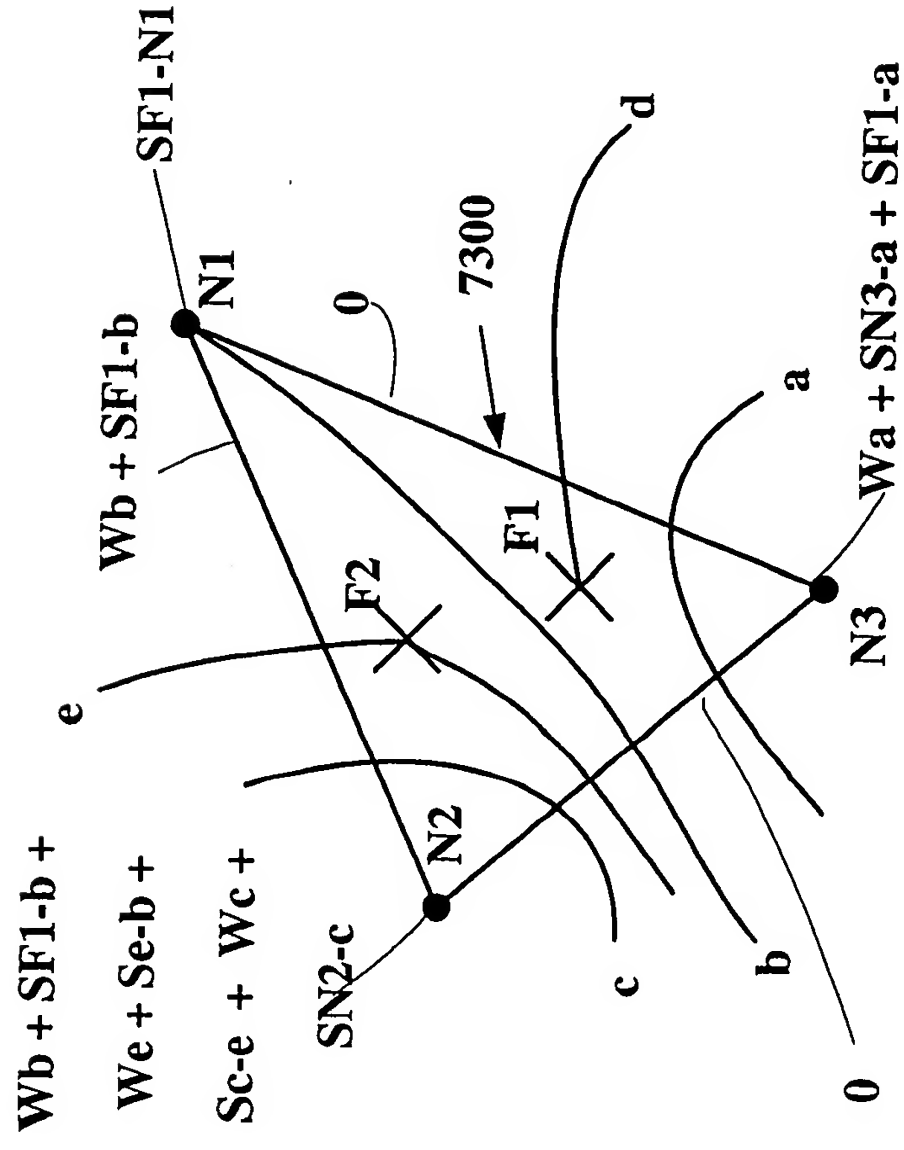
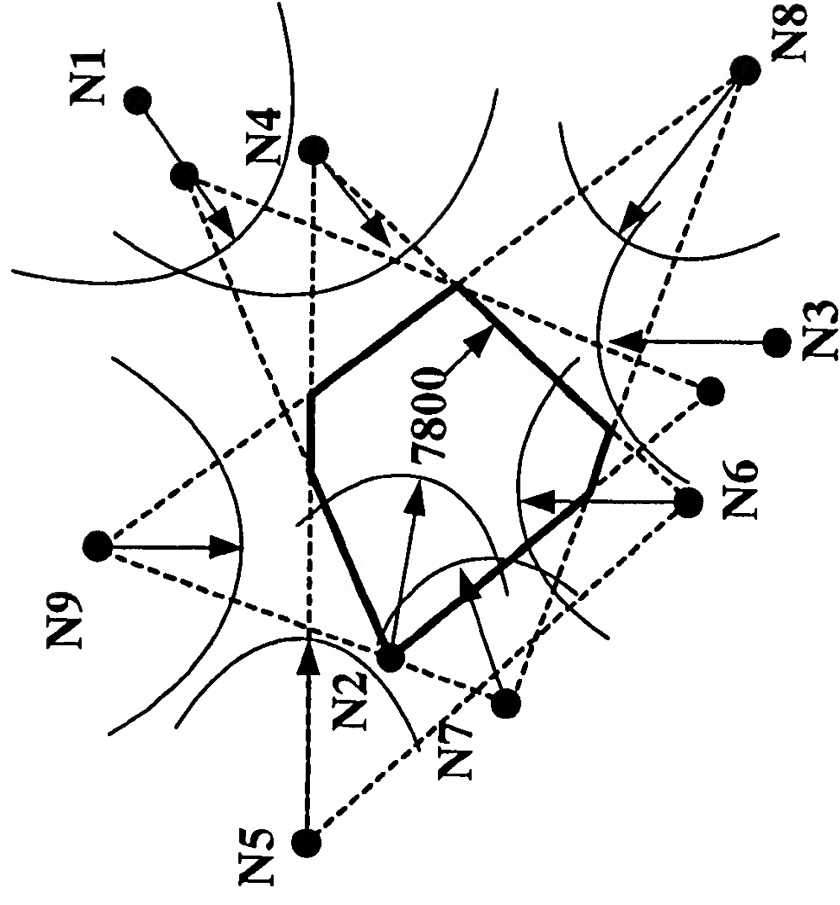


Figure 75

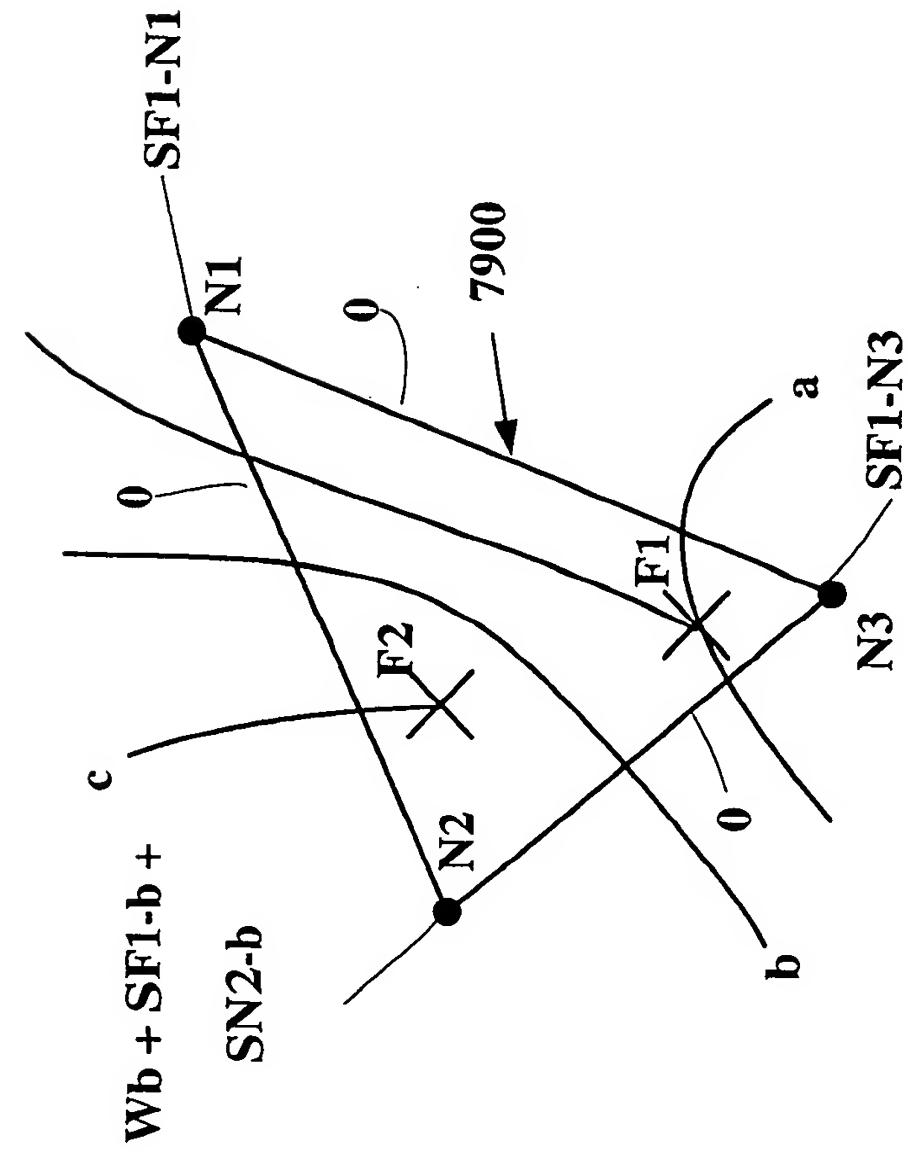


*Figure 76*

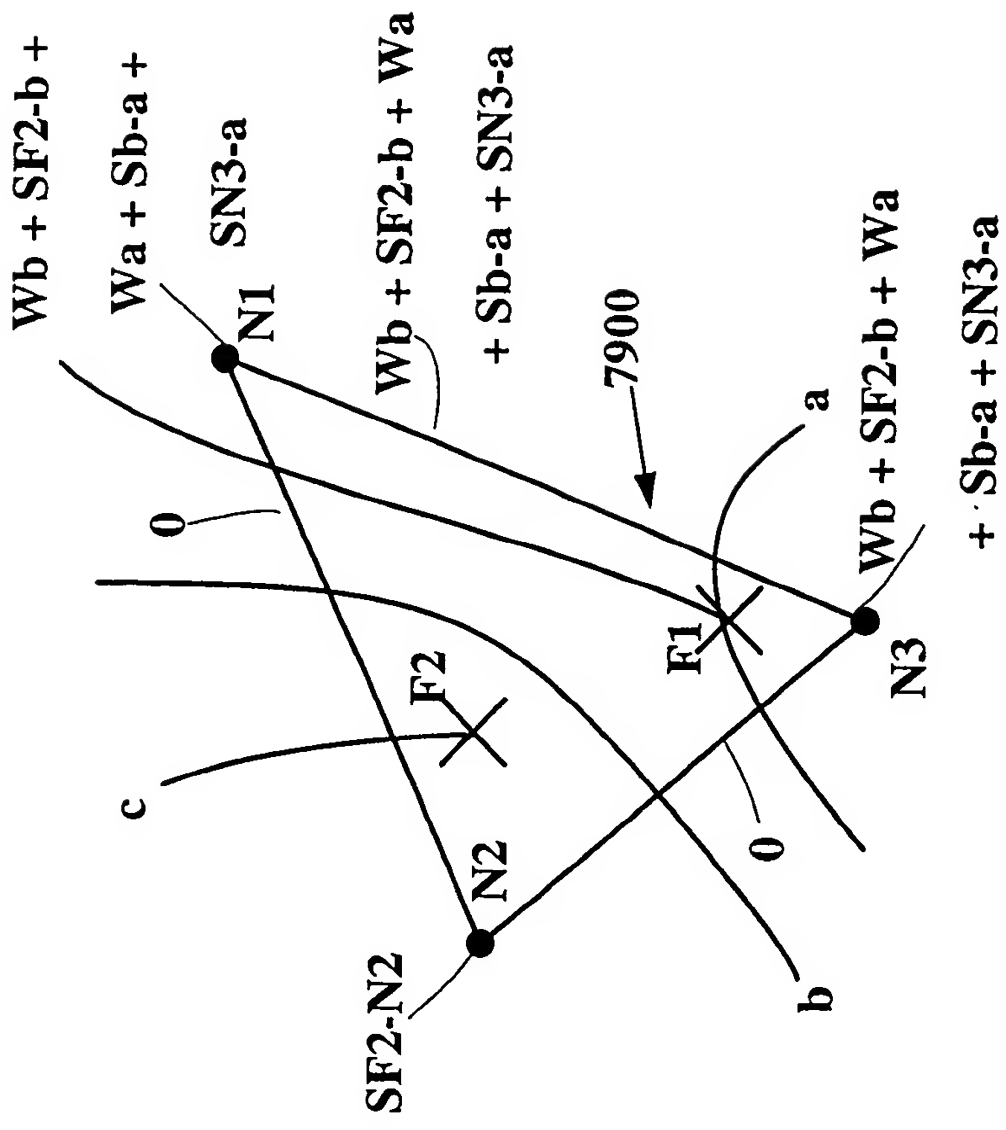


*Figure 78*

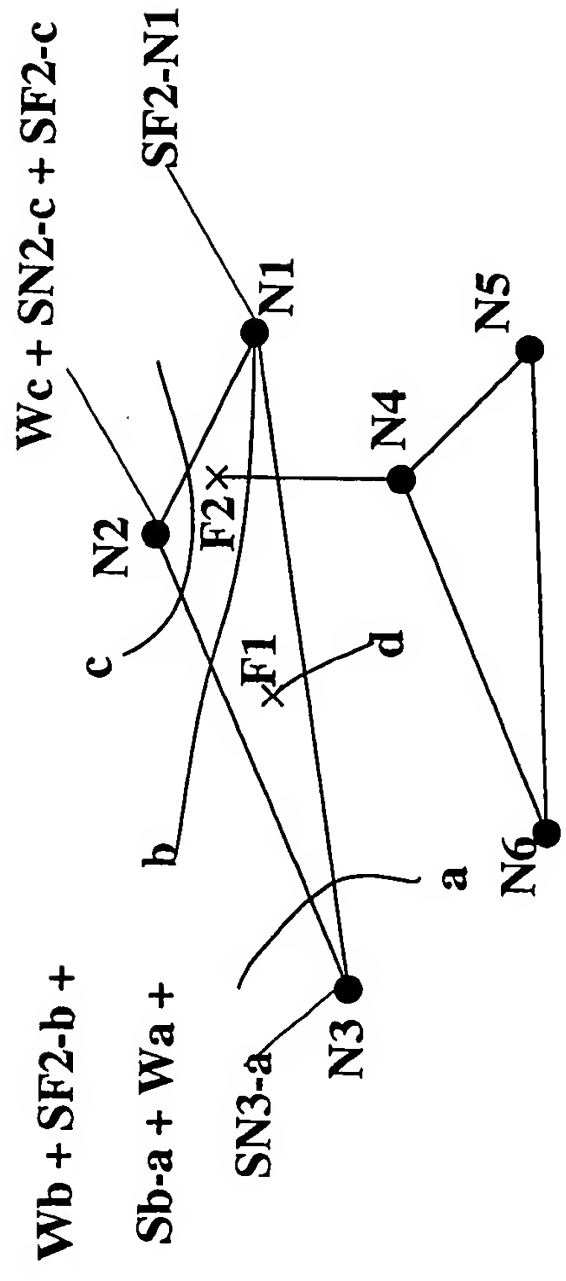




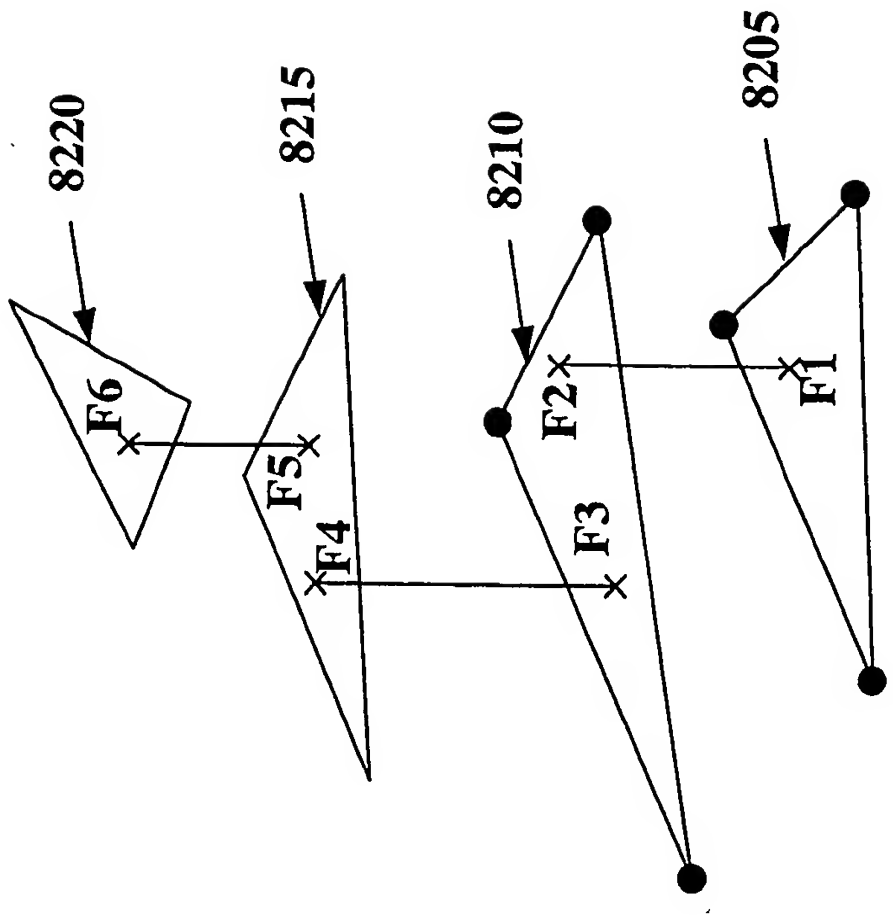
**Figure 79**



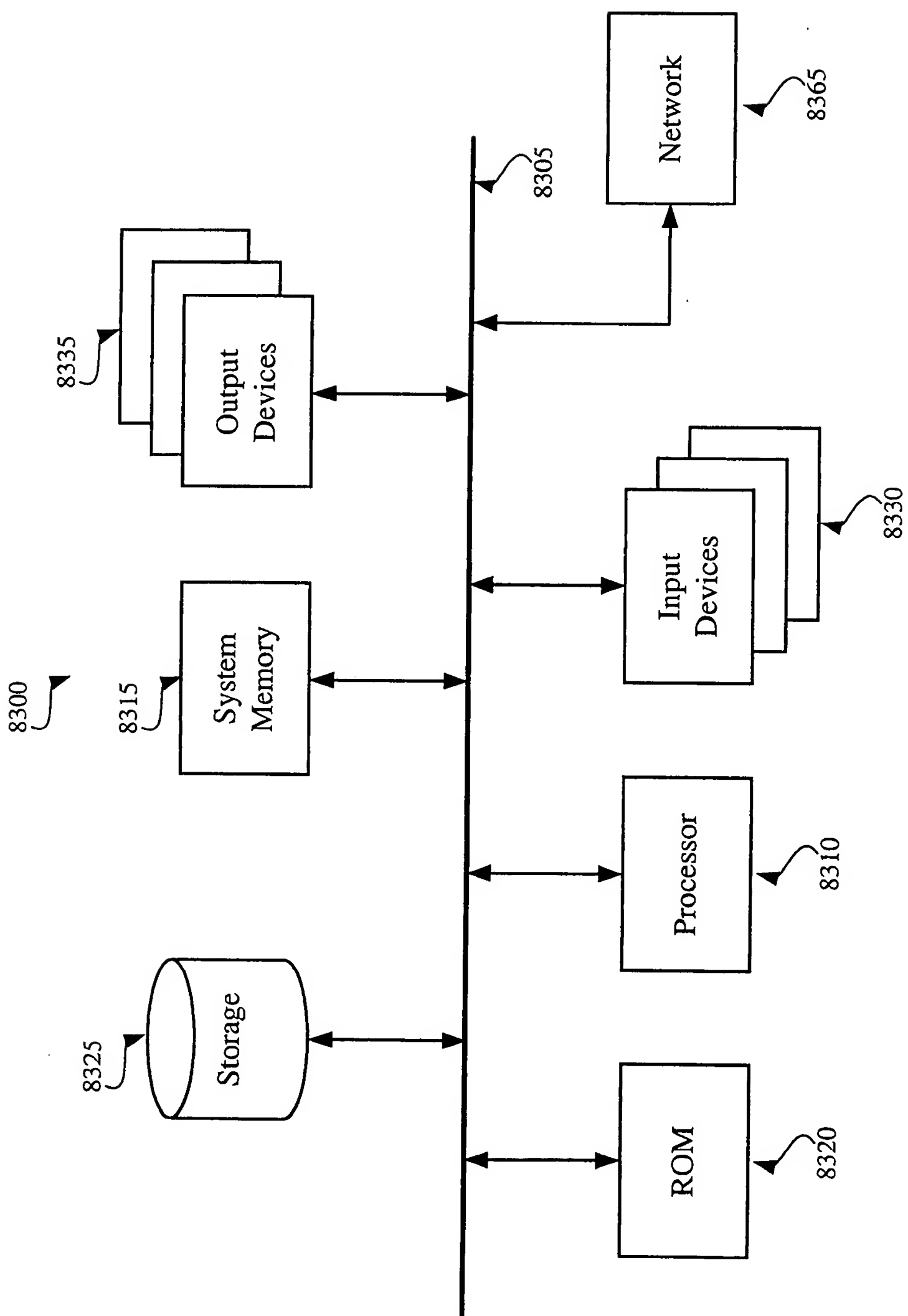
**Figure 80**



*Figure 81*



*Figure 82*



*Figure 83*